THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVII. No. 1965.] LONDON, JANUARY 8, 1901. [53RD YEAR. PRICE 6d.

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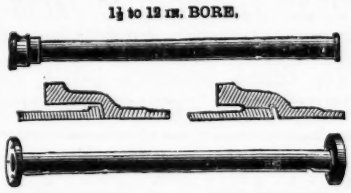

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A SAVING IN FUEL OF £18 PER WEEK.

A couple of months ago when coal, which formerly cost us 8s. per ton rose to 12s. 6d., we read a lecture on the cost of steam production by John Holliday, in which the following paragraph appeared:—

Mr. Bryan Donkin, M.Inst.C.E., has published figures from some tests he carried out with different kinds of fuel in the same boiler, the conditions in all cases being the same; the results are comparable on the basis of the cost of fuel required to evaporate 1000 gallons.

Kind of Fuel.	Cost of Fuel per Ton.	Water Evaporated per Pound of Fuel.	Cost of Fuel per 1000 Gallons Evaporated.
	s. d.	lbs.	s. d.
A. Dust Coke	5 0	6	3 8
B. ,, Welsh Coal . . .	10 0	8	5 3
C. Large ,, ...	22 0	9	10 11

Discovering that the Sheffield Gas Company made a considerable quantity of coke dust, which they gave away to builders and others, we entered into a contract for a supply for three years. Having a spare boiler, we had Meldrums' forced draught fitted, and soon discovered that coke dust made a very satisfactory fuel for steam raising. Our second boiler was then fitted, and we are now burning coke dust on the two almost exclusively. From an economical point of view, the experiment is very satisfactory, as will be seen from the following figures:—

Average week, Coal only, on One Boiler.

	£ s. d.
45 Tons at 12s. 6d.	28 2 6
Ashes at 2s., Seven Loads	14 0
	£28 16 6

Present Consumption on Two Boilers.

	£ s. d.
Six Tons of Coal at 9s. 3d.	2 15 6
Coke Dust	3 4 0
Two extra Stokers	2 12 0
Flues cleaning	10 0
Ashes, 12 Loads at 2s.	1 4 0
	£10 5 6

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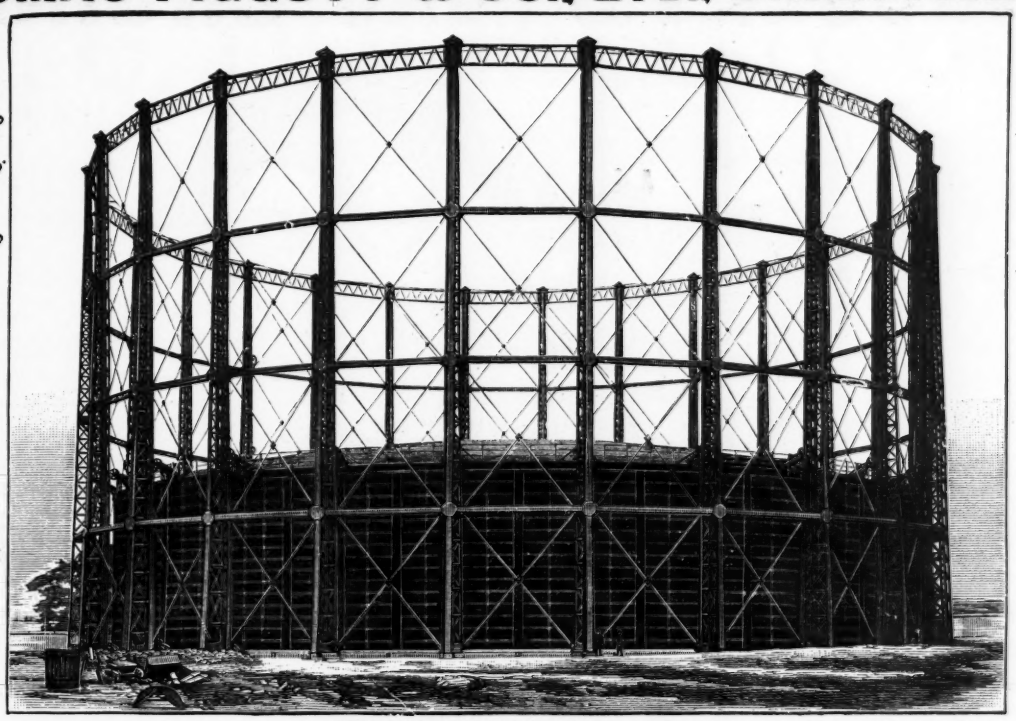

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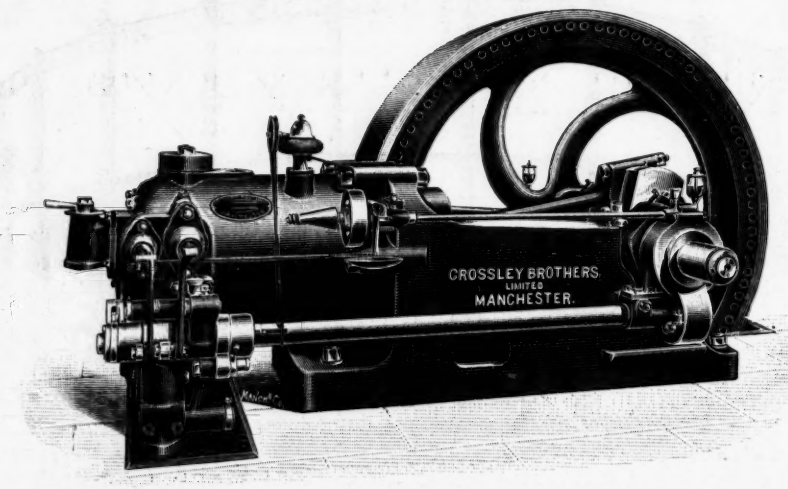

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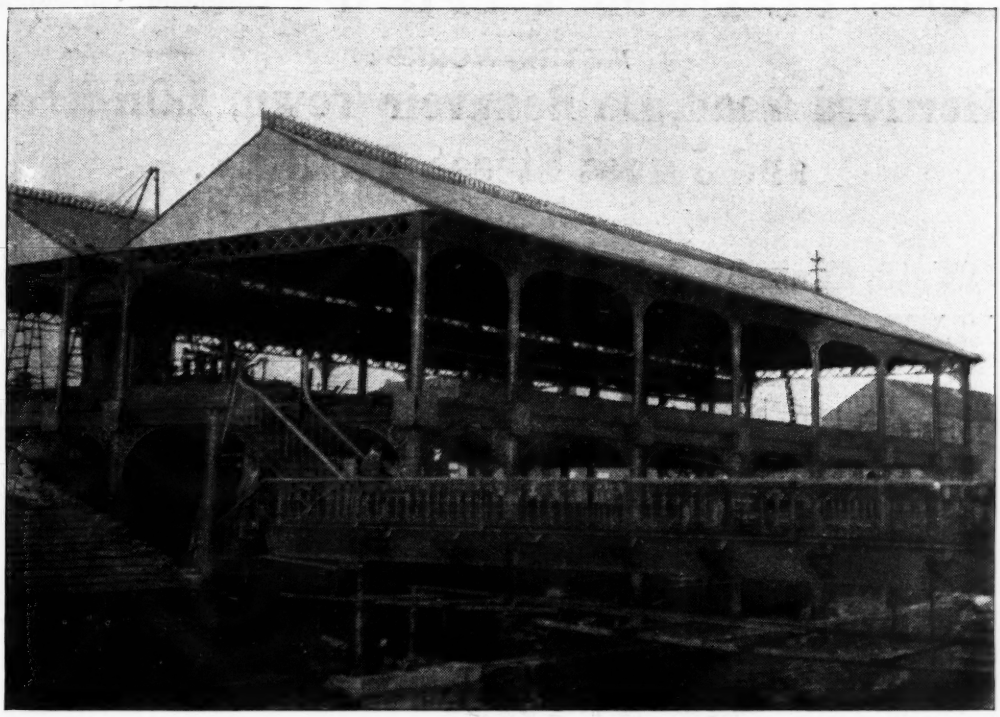

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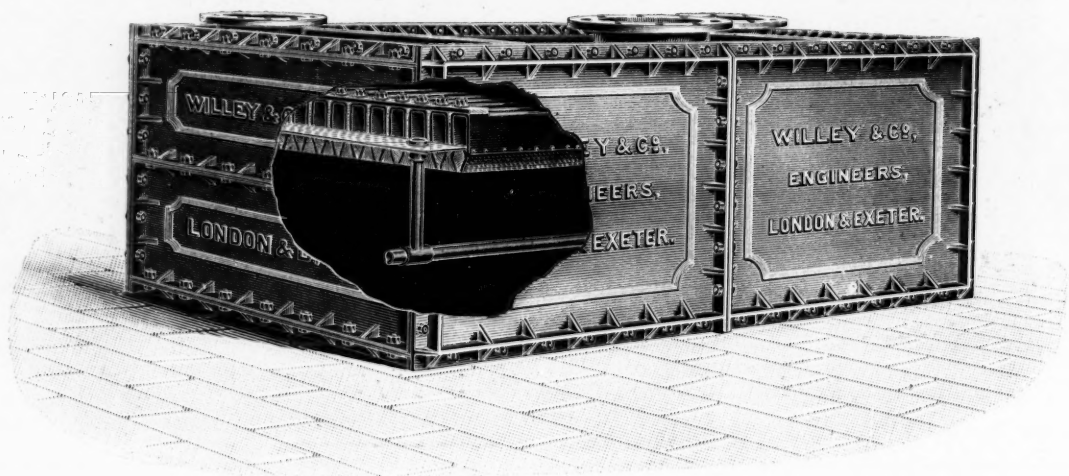

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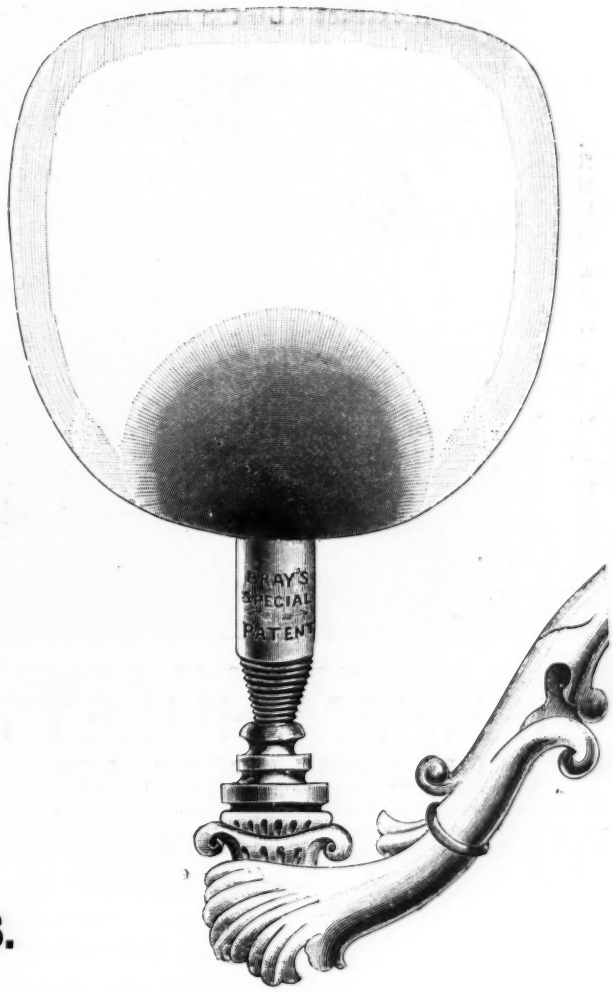

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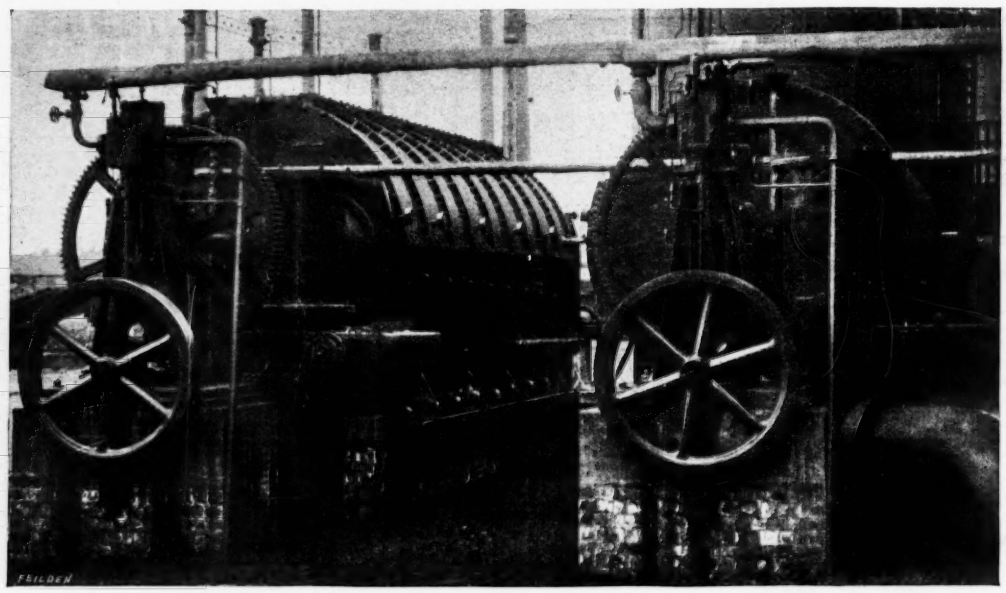

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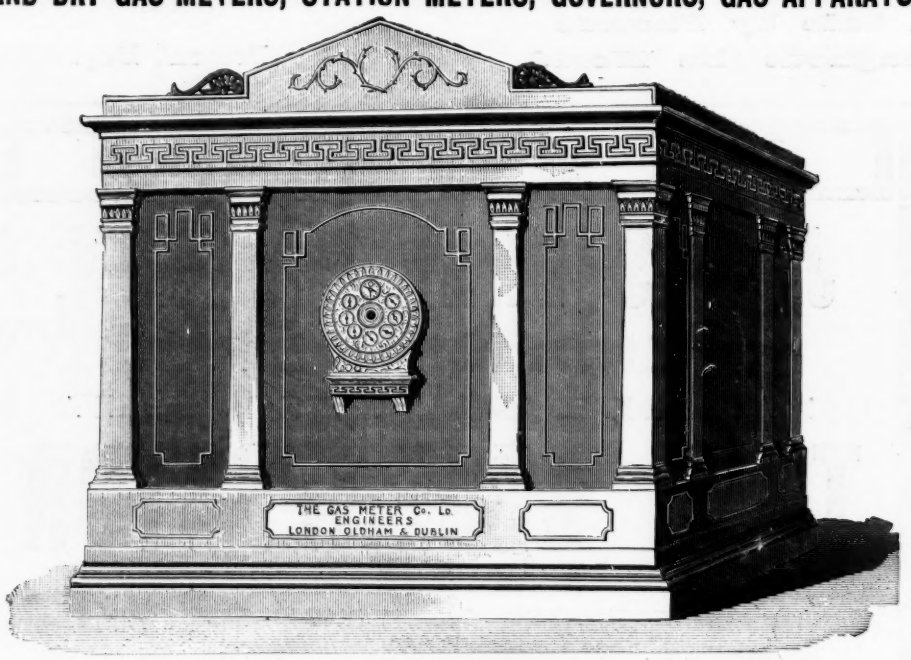

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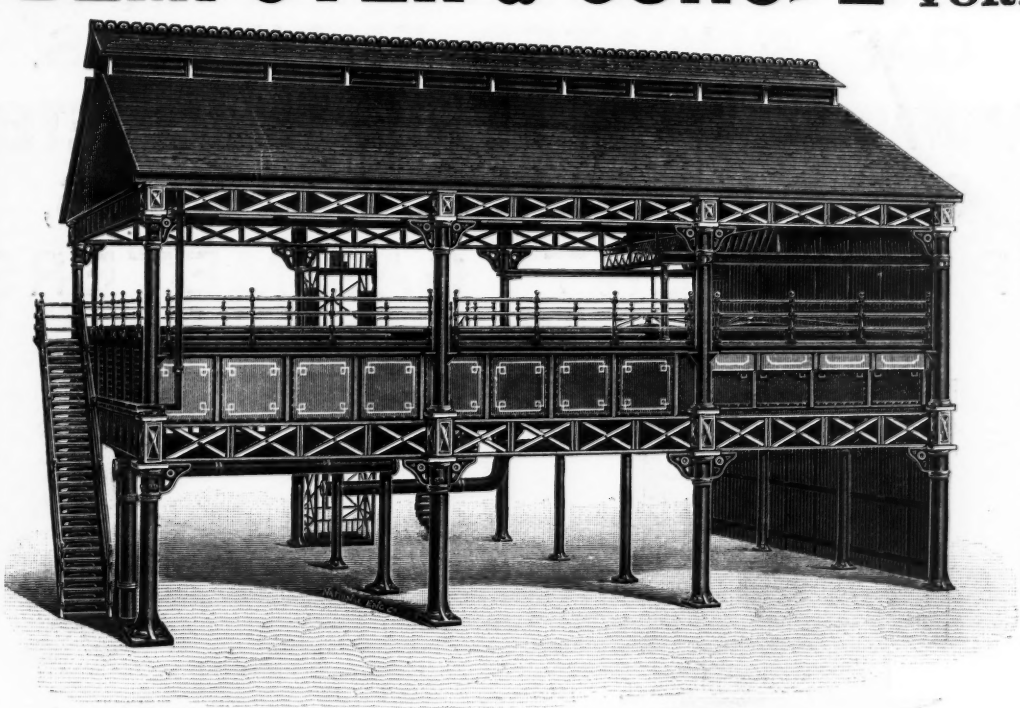

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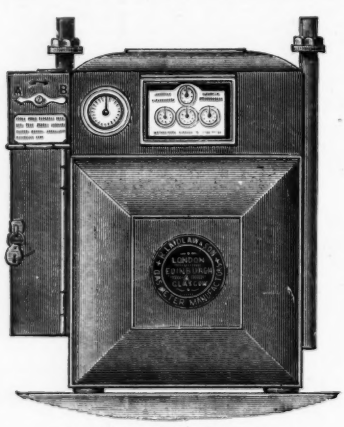

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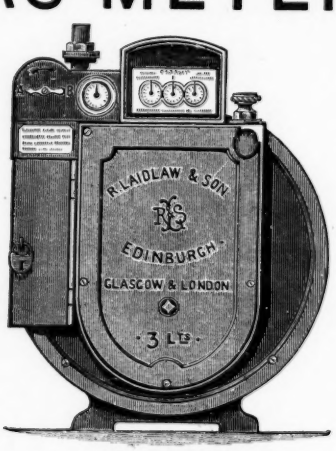

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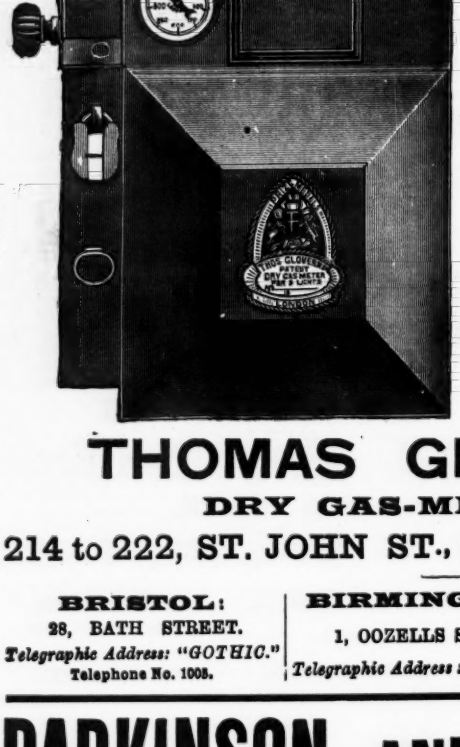

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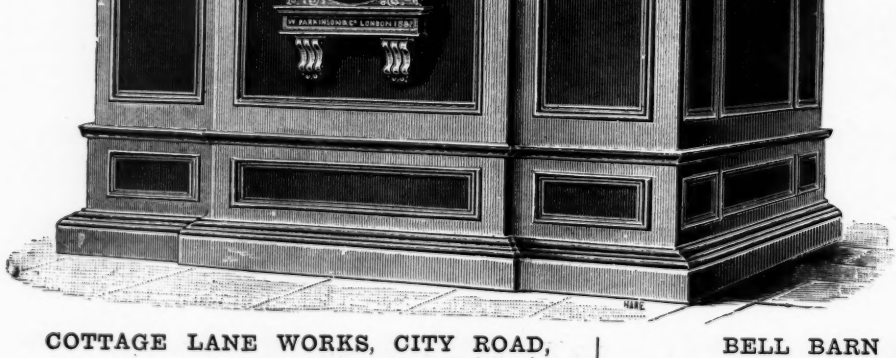

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[See also Advt. on last White Page.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

VOL. LXXVII., No. 1965.——TUESDAY, JANUARY 8, 1901.

EDITORIAL NOTES.

The Lights of Fashionable London, 1900-1901.

SOME years ago we published an account of the street and shop-front lighting of London, as viewed by a pilgrim interested in the subject, and occupying that very favourable point of 'vantage for seeing the Metropolis—the top of an omnibus. At that period neither incandescent gas lighting nor central station electric lighting had "arrived," as the French say; and the public street lighting was yet in the primitive stage of the 5 cubic feet flat-flame burner and the average meter system. If anyone were to repeat the pilgrimage to-day, starting (say) from the Mansion House, and working round through Holborn to Regent Street, Piccadilly, and the Strand or Whitehall, the impressions he would receive would be greatly modified. A dry, cool evening, when the air is a little misty, is most favourable for judging the lighting; and the hour should be, in the first place, before that of shop-shutting, to be followed, for the sake of contrast, by a later trip over some of the same ground. The most striking thing to be noticed is the extremely local character of the shop lighting, and the shameless way in which the highway authorities have depended upon the shops and the public-houses to make good their own default in this service. The shop lighting is wholly concentrated in and on the windows. Rarely is any attempt made to light up the whole façade; and the street frontages are thus gloomy in the extreme. A self-respecting corner tavern is quite a relief to the eye, with its generous provision of outside lanterns.

An enormous amount of lighting is evidently needed to make anything of a show-window. Most of it, there is no use in denying, is electric. The cost must be very heavy, because the lights are used with great profusion; even arc lamps being multiplied as thickly as single gas-burners used to be in former times. The small enclosed arc lamps are in considerable vogue; but they are not very effective. A better result is procured when a few ordinary arc lamps are added to a mob of powerful incandescent lamps too numerous to count. The blend of the two colours is an improvement to both. No expense on this score deters the proprietors of the big drapery and fancy shops from obliterating the difference between night and day for the comparatively short time they do business after dark. Where incandescent gas-burners are used, they not only hold their own, but serve to set the standard of brilliancy for the electric lighting. This latter service has been remarkably well done this winter in the West of London; the brightness of the incandescent lamps showing that they are driven very hard. Somehow, incandescent gas lighting seems to be "nobody's child" in this part of the town. A few Wenham lamps still linger in shop entries; and the albo-carbon light is not extinct. One may go for miles here without seeing a flat-flame or argand gas-burner in a good business house.

The universal electric lighting must hit the Gaslight and Coke Company hard. It would be of interest to know precisely how matters stand now with regard to the district once spoken of by the Governor of the Company as the "Bond "Street Quadrilateral." When we last heard of it, the competition of the electric light had not touched the total gas consumption of this region. We do not see why the Gas Company should conceal the truth of the actual situation. It might, indeed, help them in Parliament to show that their consumption is only growing on the outskirts of the district, where every new customer means fresh capital expenditure. The actual state of affairs in the central area seems to be very closely approaching that aimed at by the 29th clause of the Electric Lighting Act of 1882, which gives the Board of Trade power to relieve gas undertakers of their legal obligation to supply unremunerative districts, upon such terms and conditions as may be thought proper. In the case of the Gaslight and Coke Company, who do not charge meter-rent, they are burdened with the whole cost of "standing-by" the huge West and West Central districts, without being able to recoup themselves for it in any way. The electricians complain bitterly of their "load factors" in such regions, and often devise some ingenious plan of charging, for catching the customer who merely makes a convenience of them. But surely the Gaslight and Coke Company have a substantial grievance of their own here which no "Brighton "system" of charging would remove.

Throughout these same Metropolitan regions, the public street lighting is in a deplorable and even scandalous condition of neglect and mismanagement. In places the old single flat-flame lamps remain, unimproved these last twenty years. They can scarcely be seen while the shops are open, and afterwards the street is practically not lit at all; for this standard of public lighting is not worthy of the name. Then, again, where electric arc lamps are strung along the centre of the roadway, as in Regent Street and Waterloo Place, they do not effectively light either the road or the footpaths. They are in the wrong place for service, as we have often urged; and in the slightest mist they appear to withdraw into their glass shells like ghostly glow-worms suspended in the thick air. Nothing but the rankest prejudice can call this sort of thing good street lighting. We challenge the police who have to regulate the traffic, the drivers of omnibuses, the cabmen, and any jury of wayfarers who might be stopped in the street by the Coroner's officer, in the good old common-law style, to bear witness to the truth that the only really effective method of public street lighting for a London winter—the only lamps that really and truly conquer the obstacles to good road lighting presented by thick weather, unreflecting frontages, and black mud, are to be found in the high-power systems of incandescent gas lighting. These lamps flood the roadway with cheerful, helpful light, without dazzling or wavering. It is light in which a nervous person may dare to cross the street where the traffic is at its densest and fastest, and is the only light that is thoroughly appreciated by the dauntless officers of police whose control of the vehicular traffic at the chief street crossings of the Metropolis is the admiration of all beholders.

This is a true picture of the condition of public street and shop lighting as it is in fashionable London at the present time. If in some respects it is not flattering to gas, there is no use, nor sense, in denial or suppression of the facts. Fashion has, of course, a great deal to do in making shopkeepers (who must be fashionable or else die) run after electric lighting as they do. Fashion is one of the great motive forces in civilization, and can no more be gainsaid than the force of gravity. There is good justification for it in this instance; but although it is also fashion that has put the arc lamps into the West-end streets, they are failures there. The Corporations of the West London Boroughs ought to perceive this. Westminster knows it already; and perhaps Sir John Aird, Bart., the Mayor of Paddington, may have influence enough to keep this important Municipality equally on the right side of the question.

Trade Unionism and the Coal Miners.

WE publish elsewhere a commentary upon the Board of Trade Annual Report on Trade Unions in 1899. The only point in the report—it is, however, the principal one—to which we would here refer is the increased membership and the growth of the funds of the Coal Miners' Unions. In 1899, more than 71,000 miners became trade unionists—about half the number being employed in Wales, and the other half being distributed over England and Scotland. The increase in 1900, though probably not so large, must have been considerable, as great pressure has been brought to bear upon non-unionists to join the unions—several strikes, and many threats to strike, having been directed to that object. The total membership of the coal miners' societies throughout the United Kingdom must be now about 450,000.

The funds in hand have increased at a far greater pace than the membership. The year 1899 saw the balances advance by strides; 1900, by leaps and bounds. We have only the figures for the former year; but it is a matter of common knowledge that the men have been making unusually heavy contributions during the past twelvemonth of high wages. The funds of the Northumberland and Durham miners amounted in 1892 to £62,000; at the end of 1899 they

had reached £184,000. Just before the strike of 1893, the Yorkshire, Derbyshire, and Nottinghamshire miners together possessed £206,000 (reduced the following year to £26,000); a year ago they held £304,000; and they have probably since added at least another £100,000 to their balances. Of the societies we have instanced, only the Durham Miners' provides sick benefits, and none of them superannuation allowances. They are simply fighting organizations or they are nothing.

These facts, taken in conjunction with the expressions that have fallen from the leaders of the men from time to time during the last few months, and considered in the light of the past history of the relations between the coal miners and their employers, bode ill rather than good for the future. The annual conference of the Scottish Miners' Federation was held the other day in Edinburgh; and the same aggressive attitude was taken by the speakers thereat as has been assumed by their English and Welsh brethren. The President, in his opening address, congratulated the miners of Scotland on the state of Trade Unionism prevailing among them. For the first time in their history, he stated, the Scottish miners were now fully organized. After remarking that during the past year wages had been fair—"he did "not mean fair as compared with the selling price of coal, "but in the sense that they had been considerably above "the average of the past 25 years"—the President proceeded to congratulate the miners of the West of Scotland upon their having obtained (by the simple process of taking it) the eight-hours day.

In this action of the men, the employers, it will be remembered, reluctantly acquiesced rather than risk a strike when trade was abnormally active. This fact was brought to the notice of the Federation by the President, who added that "the probability was that in the very near future they "would have to fight almost to the death to defend their "eight-hours working day in the West of Scotland. He "hoped the miners would be prepared to fight even to the "verge of a general strike rather than go back to the long "hours." When we add that the speaker further remarked, amid applause, that "he sincerely hoped the employers "would have more sense than to ask for a reduction of "wages . . . there would require to be a very con-"siderable change of matters before any reduction should "even be hinted at," the spirit now animating the Scottish miner will be apparent.

Very instructive also are two other items relating to the miners of Scotland, one in the report of the proceedings of the Federation, the other in that of the monthly meeting of the Lanarkshire Miners' Union. Referring and objecting to the employment of Poles in the coal mines, one of the speakers at the Federation conference remarked that at some collieries the Pole was preferred for employment "because "he was more docile" than the British workman. A subsequent speaker urged that the case for the miners should be based simply upon the danger these Poles are to the lives of workmen. That, he said, was quite sufficient ground for action, "without alluding to the docility of the foreigner." We are glad that the reporter preserved for us these remarks; for it is possible to place beside them a delightful specimen of the British workers' "docility." At the meeting of the Lanarkshire Miners' Union, it was reported that in one of the collieries the miners were being pressed to work beyond the eight-hours day because of the pit having been thrown idle through the blowing down of the chimney-stalk during the recent storm. "It was agreed to advise "the men to resist any such attempt, even should it be "necessary to strike work!"

If this is a fair specimen of the reasonableness and of the appreciation of their own (to say nothing of their employers') interests to be found among the Scottish miners—whose business capacity as Scotsmen would appear to have been overlaid by their stupidity as Trade Unionists—the prospects of continued peace in the future are indeed remote. It is impossible to conceive of any but the most worthless employee other than a unionist refusing to put his shoulder to the wheel under the circumstances just mentioned. What a merciful dispensation it is that gas-fitters and main-layers are not unionists; otherwise they would be going on strike when asked to work overtime at stopping an escape or repairing a fractured main. What with the eight-hours day, the "living" wage, and the question of sliding-scale or no sliding-scale, the labour outlook in the coal trade for the next year or two is not by any manner of means one of the brightest.

The "Mond Gas" Bill.

It is impossible to deny to the "Mond Gas" Bill a high degree of technical interest; and it would be foolish and rash for the custodians of the established gas undertakings in the region included within the scope of this project to take it otherwise than very seriously. The main object of the Bill is stated in the preamble to be the manufacture and supply, in parts of South Staffordshire and East Worcestershire, "of gas, and particularly of the gas commonly known "as Mond Gas, for the purposes of motive power and heat-"ing, but not of illumination." The incorporated Company would be called "The South Staffordshire Mond Gas (Power "and Heating) Company," with a share capital of a million pounds sterling, and borrowing powers to one-third of this amount. The sites scheduled for works are situated in the parishes of Tipton, Bilston, Darlaston Kingswinford, and Smethwick. The Bill comprehends all the usual clauses of a Gas Company's Bill, with some others suggesting important variations in points of detail which need not be gone into here, as they do not affect the prospects of the passing of the preamble. The maximum price of the Company's gas is put at 3d. per 1000 cubic feet to consumers of more than 4 million cubic feet per quarter, and 4d. per 1000 cubic feet for smaller quantities. There is a proviso that "should the price of "good quality slack at any time exceed the price of 6s. per "ton delivered at the works of the Company, then the price "of gas may be increased beyond the above maximum by "one-eighth of a penny per 1000 cubic feet for every shilling "of such excess cost of the raw material." In the event, however, of the profits of the Company in any single year being more than sufficient to pay 10 per cent. dividend on the share capital, one-half of the surplus is to be applied in forming a reserve fund of £100,000, and the balance is to go in making a rateable reduction of the price of gas. Clause 52 runs as follows: "Nothing in this Act contained shall be "construed as entitling the Company to any monopoly or "exclusive right to supply gas for the purposes of motive "power and heating within the district."

The above represents the scheme of this interesting experiment. How much further it will get remains to be seen. As might be expected, the ordinary newspaper reader seems to have acquired the totally erroneous and unwarranted impression that the Company offer a supply of gas for every purpose at 3d. per 1000 cubic feet, which he quotes to the injury of gas companies better known to him. Of course, the Bill carefully avoids promising anything of the kind; but the "man in the street" is not curious to mark the qualifications and reservations in a Bill of this nature, the wording of which he never sees. He has no means of knowing anything about it besides what his newspaper tells him; and the chances are that the newspaper is no more particular in regard to the exact meaning of the Bill than its readers, who probably take "Mond" for the name of a place. It is a Gas Bill; and the gas is to be sold at 3d. per 1000 cubic feet. That is enough for the newspapers and their readers. So that, without intending it, the promoters of the Bill have already done ordinary gas undertakings some injury.

We have before recorded our judgment of the merits of the project, and have only to make a correction of the foreboding that if the concern should ever arrive at working stage it will either go into liquidation within three years, or be found selling common coal gas at the ordinary prices. The present Bill seems to offer a safeguard against the latter alternative in fixing the maximum prices of the Company's gas as above stated. All the same, however, it would be wrong for Parliament to put the Company in such a position that it would be in the painful dilemma of seeing all its capital wiped out, or obtaining sanction for a revision of selling prices. Capital, once sunk, does not suffer itself to be annihilated without a desperate struggle; and many an existing gas company is doing business upon a different footing from anything contemplated by its founders. The preamble is not justified, besides, in mentioning "Mond Gas" as "commonly known" by this name. It is not commonly known at all. Few people know anything about it. As we have already suggested, the word "Mond" in this connection may be popularly understood to mean a place, which is a not unnatural error, seeing that there is a town called "Mold" in the United Kingdom. There is a smack of presumption in the very title of the Bill. It is difficult to understand how such a measure came to be put forward, on such a scale, seeing how little experimental justification has yet been gathered for the creation of a new industry of the kind.

The Close of a Troubled Career.

THE days of the Singapore Gas Company are numbered; and three months or so hence will, unless the unforeseen happens, bring to a close the career of an enterprise which has experienced more vicissitudes of fortune than usually fall to the lot of gas undertakings. For this, the depreciation of the dollar was largely, though not entirely, responsible. Into the other causes there is no necessity now to enter. It is sufficient to say that the present directorate have devoted themselves assiduously to the improvement of the Company's financial standing, and with a fair measure of success. The negotiations which are about to end in the transfer of the undertaking to the Municipality have been dragged wearily along; but the fault has not been on this side. Time and again the bargaining looked like collapsing on points far beneath the level of fairness. Had it done so, and had the Municipality carried out their threat to erect new works, it would have been a bad thing for the shareholders. But the unrighteousness of the proceeding would have rested upon the Municipality. The shareholders, however, determined, come what might, they would stand firm to a price which the best opinion has confirmed is about the value of the concern; and right has gained the day, though there are some among the shareholders who think they are not obtaining all to which they are entitled. The brightest spot in the negotiations was when the Municipality accepted the proposal of the Company that they should receive for their undertaking such a sum as might be estimated by Mr. Corbet Woodall—such sum not to exceed £45,000—with stocks at a valuation. The £45,000 was the amount Mr. A. F. Phillips had advised the Company to take for their property. Mr. Woodall, it should be mentioned, had previously been consulted by the Municipality regarding the cost of laying down new works; and the development of matters as here recorded led to his recent visit to the Straits Settlements. As our readers are aware, the outcome of his mission was that he advised the Municipality to offer the Company £41,420 for their concern, with stocks at a valuation; and this was accordingly done. The shareholders held a private meeting at the Cannon Street Hotel last Thursday; and, after considerable discussion, on the advice of the Board the offer was accepted—the necessary resolution being moved by the Chairman, Mr. Samuel Spencer, and seconded by Mr. Benson. In connection with the final settlement of affairs, there is one thing further we should like to say; and it is this, that we trust the claims to consideration of the officials in Singapore will not be lightly set aside by the Municipality, and that the shareholders will not overlook the position of their salaried official on this side. In regard to the latter, we have confidence—notwithstanding that the original shareholders will not receive back the full amount of capital figured on their certificates; and in respect of the former, the Municipality must, if they study their own interests, take advantage of the experience of every member of the present local staff.

Dearer Money.

WHEN, in December, 1899, the Directors of the Bank of England were obliged to raise their rate to 6 per cent., we expressed the opinion that until peaceful conditions again prevailed in South Africa a continuance of dear money was to be expected. Since then the bank-rate has only been below 4 per cent. for eight weeks—namely, from May 24 to July 19 of last year. From the latter of those dates until last Thursday the rate has stood at 4 per cent., but has now been raised to 5—a step so rarely taken just at the commencement of the year (when the dividend on Consols is falling due, and the quarter is opening in which the heaviest revenue collection is made) that more than ordinary notice has been taken of the announcement. Moreover, it is not beyond the bounds of probability that the bank-rate may have to go higher still in order to restore soundness to the financial position. However that may be, there appears little prospect of an early return of cheap money.

This present conjunction of dear money and brisk trade, with its attendants of high-priced materials and very dear coal, is a serious matter for the gas undertakings of the country. It has involved for them the obtaining of much larger sums for floating capital than are usually needed, at a time when to borrow is expensive, and when, owing to the low market price of gas stocks, it is least opportune to issue fresh capital. The point can best be illustrated by considering the principal item—that of coal. For every 1000 tons of coal in stock at the end of 1899, a London Gas Company would have had to pay about £600. At the end of 1900, that quantity of coal represented something like £1000. But a year ago stocks were very low; they are now probably twice as heavy, or even more. Then the amount of floating capital locked up in coal in the stores of the London Companies to-day is to that so locked up twelve months ago as £2000 is to £600. Assuming the stocks of the three chief Metropolitan Companies to be now twice as heavy as they were last January, the value of present stocks would be more than £300,000 in excess of the money represented by the coal in hand a year ago. When the higher price of all materials is taken into account, and the quantity of coal put into stock by the gas undertakings throughout the country during the past year is considered, the seriousness of an increase of 1 per cent. in the bank-rate, with no compensating prospect of an early cheapening of money, becomes tolerably obvious. Fortunately, the first half of the year is the one in which money grows more and more plentiful in the coffers of a gas-making concern as time goes on.

The Gas Undertakings Returns.

THE Board of Trade returns relating to the statutory gas undertakings of the United Kingdom for the year ending Dec. 31, 1899, for the Companies, and March 25, 1900, for the Local Authorities, have been issued; and a summary of the information contained in these invaluable parliamentary papers appears in another column. The number of authorized undertakings in company ownership continues to increase, and now stands at 450. The number of gas undertakings owned by Local Authorities is also a growing one, and is now 232. The nominal amount of capital represented by this statutory industry, sunk in 682 separate and independent undertakings, is £114,591,214, which would be considerably increased if all the stocks included were unified and converted, as in the case of some of the largest items. The totals relating to the carbonization of coal and cannel, and the production of different descriptions of gas, are interesting. These generalities introduce the particular information respecting the undertakings that "doctor" their product with enrichments of various kinds. The broad result is to exhibit the industry of gas manufacture for the United Kingdom in a pleasing variety of technic, for which it is to be hoped that the responsible parties could always give a satisfactory reason. Evidently, the well-used phrase "gas-works routine," so familiar in the applications of young gentlemen in search of appointments in the industry, no longer means quite the same thing for different places. The routine of gas-works sending out 59 per cent. of carburetted water gas is obviously of a different character from that of an establishment where the raw material of manufacture is coal, and coal only. As usual, the returns contain a very great deal of useful information calculated to mitigate the "Circular of Inquiry" nuisance. One of the most striking entries in the Local Authorities' list is that of the Glasgow Corporation, which, out of a year's revenue of £700,149, accuses the undertaking of having made a "profit" of £50, which was duly "carried forward." The imagination is overwhelmed by this transcendent civic virtue, which is to be commended to the earnest attention of municipalizers of the less enlightened English school.

Fog and Flood.

NATURALLY, our brief notice last week of the gratifying absence of fogs during the London winter was published under the depressing influence of the thickest fog of the season, which came on while the "JOURNAL" was in the press. That is the common fate of those who venture to make any positive statement, at twenty-four hours' range, about our great British weather. At the same time, torrential rains in the Midlands, resulting in disastrous floods which put out the fires in many gas-works, quite ruined the character of the season in the estimation of the sufferers from this plague of waters. Leicester suffered most inconvenience of any large town; but Birmingham and other places situated in the central plain of England were sadly afflicted by the floods. This visitation serves to illustrate—if illustration were needed—how far short our system of weather forecasting falls of practical utility. It is nice to be warned by the morning newspaper whether one had better take an umbrella on quitting the house, or to be assured that this national oriflamme may be left at home for once in a way. Even so, the prudent citizen knows that the prediction is only about 60 per cent. true; and he acts accordingly. But what we never are told (and it is the only thing about

the weather that is really important and worth knowing) is when to expect a "spell" of anything climatic. The weather of one day matters little or nothing, from the business point of view; but it would matter a very great deal if we could know how long any sort of weather would last. Even a 60 per cent. certainty in this regard would be most valuable. How much loss of life and property, to say nothing of mere inconvenience, could be avoided if the Meteorological Office could only foretell the probable duration of whatever "strong" weather their system enables them to forecast! The floods in the Midlands show again how much more difficult it is to rid a flat country of surplus water than a hilly district. Both classes of country are equally liable to flooding as the result of heavy and long-continued rain; but the plains remain under water longer than the high valleys. Meanwhile, it is gratifying to be able to congratulate the Thames Conservancy upon the efficacy of the measures indicated by the last great Thames Valley flood as expedient for the prevention of the recurrence of such unpleasant episodes in this important inland navigation system. The River Thames, although in strong flood, has been kept within its banks by timely attention to the discharges of the lower sluices.

The Bethesda Ballot.

THE burden of Bethesda remains unrelieved; and having already taken so much notice of this remarkable example of Trade Unionism in action, it is necessary for us to continue the narration. The ballot of the quarrymen, mentioned in this column last week, was duly taken under the conditions named—that is, with signed papers. When Mr. Young's protest against the absurdity of calling this performance a ballot—which is either a secret way of voting or nothing—came to the ears of the ingenious individuals responsible for it, they expressed mild surprise that any exception could be taken to their method of procedure. Curiously, none of the newspapers which commented upon this incident realized the gravity of Mr. Young's objection, probably because the writers, not being business persons, failed to understand the practical working of a Trade Union. The papers went out as described; and then somebody suggested that Mr. Young's objection might be removed if it was arranged that the answers should be dealt with by two independent scrutineers, who should burn the papers after the count, thus preventing any use being made of them for the preparation of a "black list." Obviously, this expedient, which was actually followed, amounted to nothing more than a patch upon a hopelessly damaged scheme. To ask a man to put his name and address upon a voting-paper is enough to destroy his sense of security. The more ignorant, and therefore helpless and suspicious, he is, the less will he believe that the sense in which he has voted will not leak out. The result of this farcical "ballot" is to show a large majority of the quarrymen in favour of rejecting the employer's terms for renewing work—as a matter of course. Nothing is therefore changed, either for better or worse, by this much advertised performance. The old workmen are free to go where they like in search of a livelihood; the employer can elect at his leisure what, for the future, to do with his property.

Lighting by Acetylene is the title of an article by Theo. Verney in "Cassier's Magazine" for this month. The author is of opinion that acetylene will not become a serious competitor of electric light or coal gas in the larger towns, but in small towns and villages where the amount of lighting done will not warrant the expenditure called for by electric or coal gas plants, acetylene is eminently well adapted—for isolated buildings of various kinds it is an ideal illuminant.

Forthcoming Arbitrations.—The proceedings in the arbitration regarding the Glastonbury Gas-Works transfer are fixed to commence to-day, at the Surveyors' Institution, before Mr. Charles Hawksley, Umpire, and Mr. William A. M'Intosh Valon, Arbitrator for the Company, and Mr. Alfred Colson, for the Corporation. The following witnesses are engaged in the case: For the Company, Mr. Thomas Newbigging and Mr. Joseph Cash; for the Corporation, Mr. E. H. Stevenson and Mr. W. R. Chester. Counsel for the Company is Mr. J. H. Balfour Browne, Q.C.; and for the Corporation, Mr. A. J. Ram, Q.C. The Newtown Gas Arbitration has been arranged to take place on Feb. 13, before Mr. James Mansergh, President of the Institution of Civil Engineers, Umpire, Mr. William A. M'Intosh Valon, Arbitrator for the District Council, and Mr. J. Shiress Will, Q.C., Arbitrator for the Company. The expert witnesses so far engaged are for the District Council Mr. Alfred Colson, and for the Company Mr. E. H. Stevenson and Mr. W. R. Chester. The date of the Ossett arbitration has not yet been decided.

WATER AFFAIRS.

The County Council and their Water Bill.

IN another part of the "JOURNAL" we give a full abstract of the Bill promoted by the London County Council to sanction the acquisition by them of the undertakings of the London Water Companies. This is the twenty-fifth Bill introduced by the Spring Gardens authorities with the object of obtaining control of the Metropolitan Water Supply; and we venture again to predict that, if it should be proceeded with—though even Mr. Shaw Lefevre, a member of the Council, seems doubtful as to this being done—it will be no more successful than its predecessors. Consequently, there will be a further squandering of the ratepayers' money on a project which cannot but prove abortive, in view of the opposition with which it has been threatened by the Government. What the actual cost has been of all these attempts to gratify what has been aptly characterized as the "vaulting "ambition" of a section of the County Council, and of their predecessors, we shall know when a complete return of the expenditure is published, as we believe it some day will be; but Sir Theodore Martin, who has had more than fifty years' experience in the promotion of Private Bills, says, in a letter which appeared in "The Times" last Tuesday, he can have no doubt that it has been enormous. And yet, as he points out, the parties who have been guilty of this enormity have the audacity to pose before the public as the only people who "know how to attend to the interests of the community of "London," and sneer at the endeavours of a former Government and their so-called "irresponsible" nominees to settle this question after proper negotiations with the Companies. Mr. Cross and those who acted for him had no "vaulting "ambition." Their aim was solely the welfare of the community; and no one entrusted with such a task as they had could fail to keep steadily before him, at every stage of the proceedings, his entire responsibility to the ratepayers.

Mr. Shaw Lefevre, in the letter to which reference was made last week, urged that the Council's purchase scheme is the only one that holds the field, and "affords a possible "solution of the Water Question;" and he contended that it must come before Parliament as the only possible and practical alternative to the Government Bill, whenever that is introduced. Sir Theodore Martin does not see that there is any "must" in the matter. The Council, as we remarked last week, will have an opportunity, when the time comes, of making out what case they can for their scheme; and the Companies will be heard in opposition to it. That it will be bitterly opposed Sir Theodore Martin thinks will be obvious from a glance at the Bill embodying it. The proposal contained in clause 4—that the undertakings should be transferred to the Council within a year from the date of the passing of the Bill, leaving the terms and conditions of the transfer, where no agreement had been made, to be subsequently settled by arbitration—is one which, he considers, "would never be accepted by any owner of property," much less by the possessors of such vast concerns as those in question. If a precedent of this kind were once admitted, why, he pertinently asks, should not the Council deal with the Gas Companies or the local railways in the same way? No one can contemplate such a "daring proposition" without foreseeing to what prolonged discussion—accompanied, of course, by a commensurate outlay of money—it would give rise. If it were pretty clearly shown by the Bill that the Council's scheme would have the twofold effect of relieving the consumers from what certain wiseacres are often pleased to call "the thraldom of a tyrannical monopoly," and of putting into the pockets of London ratepayers the "bloated dividends" which are said to be enjoyed by its "arrogant possessors," there might, perhaps, in the opinion of a certain section of the public, be some justification for its existence. But when it is found that the Council, while affecting contempt for the suggestion of Lord Llandaff's Commission that the undertakings might not be self-supporting, and that the deficiency would in that case have to be made up out of the district rate, actually contemplate such a contingency, and make provision for it towards the close of their Bill, it becomes obvious, as Sir Theodore Martin points out, that the authors of this "only scheme" really in their hearts are afraid that it may be financially unsuccessful. This, he says, is the danger the ratepayers will have to face "if the County Council or any other body are authorized to "take the place of the Water Companies at a price which "no one can estimate beforehand." Those who have to

bear the burden of the county rate will therefore do well to assure themselves that it will not be greatly increased by any scheme which proposes so radical a change in the conditions under which the Metropolis is, and has long been, satisfactorily supplied with water.

Electrolysis of Water-Pipes.

THE explanatory remark made by the Chairman of the Chelsea Water Company (Mr. F. S. Clayton), when moving the adoption of the report at the half-yearly meeting last month—to the effect that increased law and parliamentary expenses had been partly caused by opposing an Electric Tramways Bill which it was believed would be inimical to the Company's interests, owing to the dangers arising from electrolytic action on their mains—emphasized once more the importance of a subject which the introduction of electric systems of traction has forced upon the attention of those who are responsible for the supply of water and gas, as evidenced by the reference made thereto at the last meeting of the Gas Companies' Protection Association. The matter has become so serious, Mr. Clayton told the shareholders, that the Gas and Water Companies are uniting in order to bring pressure to bear upon the Board of Trade to introduce some regulations under which those who cause the damage shall be made to bear the cost of repairing it. These remarks indicate the presence of a very real cause of complaint on the part of the Companies; and it seems fully justified by the reproductions of photographs of iron pipes attacked by electrolysis which have from time to time appeared in our columns. The "Electrical Review" treats this matter rather lightly; remarking that, with a drop of less than about half the seven volts specified by the Board of Trade, the risk of injury to pipes when laid in the neighbourhood of a tramway becomes "a mere sentiment." It is pointed out that the resistance of the joints in water and gas mains is very high—80 or 90 per cent.—and that consequently "a pipe-line is not by any means the good conductor "it might be supposed to be;" and the statement is made that on a section of track five miles long, with a five minutes' service, "the current flowing along water-"pipes paralleling the route would be of the order one "ampere—a perfectly harmless rate." Our contemporary remarks that where the pipes laid near to the power-house are connected by means of cables with the negative bus-bar, with the mistaken notion that by this means the electrolytic troubles can be reduced, "the current flowing in "the pipes is much increased," and the result is corrosion at the joints. It is recommended that the Water Companies should oppose this connection, instead of the tramways *in toto*. We are assured that so long as the drop of pressure is small, but little electrolysis can take place.

In connection with this subject, attention may be directed to the report of the Special Committee of the American Water-Works Association which appears in another part of the "JOURNAL." America may be truly said to have been the birthplace of electrolysis, and the troubles experienced therefrom led Mr. Dabney H. Maury, the Engineer of the Peoria (Ill.) Water-Works, to bring the matter under the notice of the above-named Association in a paper read at their annual meeting last year. The result was that a Special Comm ttee, consisting of the author and two other members, was appointed to deal with the question, and formulate a resolution expressive of the views of the Association thereon. This was done, and the report of which it forms the closing portion is to be acted upon at the next meeting. It will be seen that the Committee first set out a series of established facts, and then proceed to make two recommendations. The first is that street railway companies should be compelled to provide for their current a complete metallic circuit absolutely insulated from the rails and ground; the second, that no connection by which a current is carried to the pipe, or induced to flow thereon, should be allowed from pipes to rails, or to other return conductors, and that no other alleged remedy which permits the mains to carry any portion of the return current should be countenanced by those who are in charge of water-works plants. The Committee submitted for approval a long preamble and resolutions as an expression of the attitude of the Association on the question, the conclusion come to being that it is only by the use of either the conduit or the double overhead trolley system that electric railways can be operated without injury to water-pipes. This conclusion, it may be mentioned, was arrived at by Mr. Maury in the paper already referred to, which was noticed in our columns a few months ago.

ESSAYS AND REVIEWS.

FOR THE NEW CENTURY.

LAST week we offered gas engineering readers some observations on the prospects that open out before the gas industry at this stage of its development. Inasmuch as the "JOURNAL," while it is one of the oldest established and most highly specialized of technical and industrial periodicals in existence, is nevertheless much more than a mere trade organ, as a glance over the Contents Index of any volume will suffice to show, we will now supplement this rigidly limited survey with a few reflections of a character more in keeping with the nature of the broader topics that are constantly treated of in these pages. For most of us the dominating question which has imposed itself upon every serious thought for the coming time is, "What shall we do with it?" It, in this case, meaning the New Century. That most things sublunary will be very different indeed at the end of the year 2000 from their present condition is a self-evident proposition; as also is the corollary that the result will largely be due to the conscious endeavours of those who have to do the work of the world between now and then. For so much, therefore, all living are in their degree and era responsible. Yet all can see that the actual course of the world's affairs at any time is not to be referred to the conscious effort of any man, or any number of men. Every age has its own character, which it seems to take on without apparent design. We can never hope to forecast with any confidence the character and trend of the affairs of a future age; but it is just possible to form a trustworthy idea of those of a period that is past, and in this study find the only ray of enlightenment into the darkness ahead.

We shall probably be safe in remarking that the past century was, broadly speaking, an enabling time. Its chief triumphs of a material kind consisted in the removal of disabilities and disadvantages, and the opening up of facilities for human advancement. It cleared away slavery; reformed the ideals and methods of national and local government and administration; removed much of the insanitary effect of the concentration of populations; facilitated intercourse and communication; demolished many barriers to the circulation of the benefits of civilization; showed the way to co-operative endeavour for other than warlike and mercantile purposes; undermined many paralyzing superstitions; and shed intellectual and physical light over the world at large. It was a great road-making time, in many senses of the term; and of quickened travel over those thoroughfares. Nor was this all that it did. Far and away the greatest gain of the century was the message of Charles Darwin, which gave mankind the key, if not to the origins, certainly to the methods of all life and of its effects. This discovery enabled mankind, for the first time, to regulate conscious effort in harmony with the silent processes of Nature, and saved the world from much wrestling with impossibilities in all the manifold applications of human energy.

The century witnessed the growth and the tentative application to all the ordinary affairs of life of the scientific method; and the special character of the science, from which the method sprang, was accurate measurement. Of course, there was plenty of science, of a kind, in the world before the year 1801; but very little of it was bound up with known quantity. Almost anything might have been thought possible, in the domain of physics, before Grove set bounds to the ocean of speculative possibility by enunciating the principle of the conservation of energy. The determination of the mechanical equivalent of heat, by Joule, was one of the most valuable labour-saving proceedings of this or any age—to mention only one aspect of the work. It is difficult for us to conceive of chemistry or electricity without the numerical equivalents of their properties; yet they existed as sciences before quantitative determinations of the scale and proportions of phenomena were thought of. The last subject to be treated according to the scientific method is, naturally, the education and special training of the people for their work in life. This is due to the peculiar attributes of the caste of scribes and pedagogues who have monopolized this office of teaching and mind-forming since the beginning of civilization. Theirs is always the learning of the Ancients; and they hold aloof from the accomplishments of the Moderns, which they neither understand nor appreciate.

In the political world, the century has long been marked as the era of Liberty. For about one-half of its course, mankind in the centres of civilization was engaged in worshipping the idea of political Liberty, which was for the most part known only as a mere hypothetical conception; and for the remaining half-century the people of many nations have had painful experiences in connection with its realization. Few statesmen, and fewer still among the "liberated" nations, understood betimes that Freedom is merely a condition of human life—an accident, not an essential nor an objective. It is the same with another fetish of the early years of the century, Free Trade. At that period, the best human intelligences were persuaded that nothing more than Liberty was wanted to make all nations wise, peaceful, and politically contented; just as Free Trade was advocated as the infallible panacea for curing all economic ills and bringing all the peoples of the earth into concord. The event has disappointed all expectations. It is only necessary to run over in one's mind the names of the nations, to recognize how little either cult has had to do

with the making of their peoples strong, prosperous, peaceable, and contented.

Descending from national to local and municipal politics, the old century witnessed a remarkable reformation and rehabilitation of the ancient principle of local self-government. In England, at any rate, Bumble has had a fresh incarnation. So complete has the change been, indeed, that some good people appear to forget the previous stages and forms of parochial government; but the wise remember the old gold-laced cocked hat and big staff of the prototype of the modern municipal superintendent of things in general. Like the other distinguishing mark of the century's work, that of nineteenth century municipalism has been chiefly correction, clearing, cleansing, provision of necessaries. Many hard problems have been solved as municipal life went on, expanded, and intensified. Here again, the method, where it has succeeded, has been the evolutionary, not the revolutionary. Responsibilities have accrued, duties have grown, requirements have been perceived and supplied, all in the strictly natural order of development; and those municipalities have done best and most which have simply corresponded to their environment and never forced the pace of their expansion. Naturally, all municipalities have not been good for much; but neither are all places of great credit or renown. There is a proverb about the manufacture of silk purses which should be had in remembrance.

The New Century dawns with the parrot cry of "Democratize," "Municipalize," in the ears of men, just as their great grandfathers were deafened by the clamours of Liberalism and the Utilitarian Philosophy. We can see what has come to the old fetishes; and it will be our own fault if we are deluded by the vastly less imposing priests of the new cult. Our latter-day Tilletts and Keir-Hardies are small change for Bentham, Mills, and Cobden. The Utilitarians had at least reason and logic on their side; they only forgot human nature. Our Social Democrats ignore human nature too; but they are neither reasonable nor logical. The principle of Democracy in government is sound, if it means government by consent of the majority of the governed, for the good of all, without favour or discrimination. It is unsound, if it is held to mean that every Dick, Tom, or Harry is as competent to govern as he is allowed to be to sanction government. The problem of all nations is to govern by the best, for the good of all. If the sanction must be democratic—and the broadest foundation is obviously desirable—the executive must be aristocratic, in the true sense of the word. Meanwhile, it is curious to reflect that the creed of Liberalism in British national politics has been dropped of late by those who assert a claim to speak on behalf of the multitude, and replaced by Collectivism, which is the most deadly and hopeless kind of tyranny. What would Cobden have said to John Burns?

The municipalization of all our local public services, again, is preached by a set of vociferous propagandists whose interest in the matter is often in inverse ratio to their individual contribution to the rate funds of the localities in which they live. The municipality, as imagined by these enthusiasts, is something far transcending all other collections of ordinary human beings. It is superior in wisdom to Parliament; and always knows intuitively much more than a Royal Commission can ever find out about any matter. Its members may be a scratch lot of speculative builders, publicans, newspaper men, ministers of religion, professional labour leaders, and persons otherwise of no particular importance; yet in their collective capacity they can always be relied upon to make gas, supply water, generate electricity, manage tram-cars, and even work a crematorium better than persons trained to business and the management of industrial concerns. Moreover, besides being marvellously effective, a municipality, according to the new theory of such bodies, is always impeccably honest, and unfailingly honourable in all its dealings. There is nothing that it might not be trusted with, on the testimony of partisans of what are called "Progressive" opinions in municipal politics; and the moment it discovers a lack of pence to carry on any of its beneficent schemes, it will always be able to lay hands on a fresh Peter to rob for the sake of another Paul. They do not express it quite so plainly as this, preferring to talk of taxing Betterment, Land Values, and so forth; but the meaning is the same.

Obviously, the modern "Progressive" is as much mistaken as was the "Liberal" of the years before 1848 in respect of the character of his fetish. He is equally wrong in confounding means with ends. What is it that the people want? That is the question. A hundred years ago they wanted to have many things set right, and many roads made. We do not say that this preparatory and enabling work has been completed, by any means. It will never be finished, while time endures and the thoughts of men change. But it really looks as if the force that once resided in the plea for Reform had spent itself in accomplishment, and that what is needed now is Construction. The century has begun well with the erection of a great British Commonwealth, under the Imperial Crown, in Australia. We are not able to dwell much upon topics of this order, or of other matters nearer home upon which the constructive abilities of statesmen are already being focussed; but there are subjects ripe for similar treatment, upon which our regular readers can reasonably expect to have a voice. One is the remuneration of labour on sound individualistic as well as co-operative principles. The last century manumitted the slave—is the present to witness the elevation of the hireling? If so, it will be by slow degrees, and as the fruition of many trials which have not yet even been entered upon. The building-up of a worthy national system of education and instruction in the arts of peace and war, so as to fulfil Milton's noble formulary—that has to be done, if it ever is done, by the help, and with the consent, of the people. The housing of dwellers in town and country under conditions conducive to healthy living and the maintenance of individual self-respect, is another problem in construction.

More might be said; but enough has been sketched out to indicate the lie of the land. If the Nation is to live, the fresh work will and must be done. He is a poor Briton who does not feel, when looking before and after, the truth of the great saying that under the Providence of God the British Empire is at this moment the best hope for the advancement of the world upon the paths of justice, mercy, truth, and human kindness, as it is the most inspiring thought for those who, while recognizing the famous works of their fathers, determine that this and the following generation shall better them.

GAS BILLS FOR 1901.

According to annual custom, we now proceed to give in abstract form the chief proposals of the Gas Bills for next session.

The Alfreton Gas Bill is to incorporate with statutory powers a Company originally formed in 1848 for the purpose of supplying gas to the town and neighbourhood of Alfreton, Derbyshire. The present capital of the Company consists of £1500 in £5 shares; £5100 capital stock, and £4200 in £1 shares. The area of supply is defined—excluding that part of the parish of Alfreton which is within the area of the Riddings District Gas Company. The capital of the statutory Company is to be £10,800 stock representing the original capital, with £10,000 additional, and one-third borrowing powers. A renewal fund is to be created by setting aside for the purpose an annual appropriation of 1 per cent. on the paid-up capital out of the revenue, and as part of the expenditure on revenue account. Any contracts of the Company with a public body are not to disqualify members of such body for the office of Director of the Company; and no Director shall be disqualified by reason of any contract between him and the Company for any loan of money. The initial price of 15-candle gas is to be 5s. per 1000 cubic feet, tested on the works, or within 200 yards from any part thereof. Discounts up to 20 per cent. may be allowed. It is proposed to take power to specify and inspect consumers' fittings, subject to appeal to a Petty Sessional Court.

The Arlesey Gas Bill is to incorporate a new Company for the purpose of supplying gas to the parish of Arlesey, Bedfordshire, and the neighbourhood, including the parishes of Stotfold, Henlow, and Clifton. The capital is put at £12,000, with power to borrow one-third. Land is to be compulsorily acquired within three years. The maximum price of 15-candle gas is to be 6s. per 1000 cubic feet. No penalties are to be recoverable from the Company in case of unavoidable accident. Powers are asked for supplying gas in bulk, and for making application for an Electric Lighting Order.

The Golborne Gas Bill is to incorporate a Lancashire Company dating from 1867. The limited Company at present have a fully-subscribed capital of £10,000, and have no mortgage debt. The township of Golborne was included in the area assigned to the Leigh District Gas Company, by an Act of 1861, now taken over by the Westleigh, Pennington, and Bedford Joint Gas Committee. These powers of supply have never been exercised in respect of Golborne; and it is now proposed to repeal them. The share capital of the Company is to be £12,000, whereof £10,000 is to be original, divisible into £10 shares, or half-shares of £5. One-third borrowing powers are asked for. The initial price of 15-candle gas is to be 3s. 6d. per 1000 cubic feet. The interest allowed on consumers' deposits is to be 3 per cent.

The Harpenden District Gas Bill is to incorporate a limited Company formed in 1864, and now working with a capital of £12,000. The area of supply is defined and extended—to include the parishes of Harpenden, Wheathampstead, and Redbourn, in Hertfordshire. The capital is to be £40,000, whereof the original amount of £12,000 is to be deemed fully paid up, and to be personal property. The loan capital is to be in the proportion of one-fourth. No person is to be disqualified as a Director by reason of his, or a partner of his, being interested in any contract with the Company. A firm of Chartered Accountants may be Auditors of the Company. The maximum price of 14-candle gas is put at 6s. per 1000 cubic feet, tested on the works. Consumers' deposits are to bear 4 per cent. interest. A clause runs to the effect that incoming tenants are not to be liable for arrears left unpaid by their predecessors, "unless the incoming tenant shall have agreed with the outgoing tenant to pay or to exonerate him from payment of such arrears, or to continue the trade or business of the outgoing tenant, and shall have paid in respect thereof a consideration to the outgoing tenant or to the owner, lessee, or mortgagee in possession of the said premises." Permission is desired for making application for an Electric Lighting Order.

The Horley District Gas Bill proposes to incorporate a Company formed in 1885, who obtained a Provisional Order in 1886. The area of supply is defined. The capital is to be increased to £60,000, of which £20,000 is to represent the original share capital. Loan capital is to be in the proportion of one-third. There is a clause to relieve Directors from disqualification by reason of their being contractors with the Company. Additional lands are to be compulsorily acquired, partly on account of the existing storage

site being required by the Brighton Railway Company. The standard price of 14-candle gas is put at 5s. per 1000 cubic feet. Discounts up to 20 per cent. are proposed; and power is sought for specifying and inspecting consumers' fitttings.

The Leatherhead Gas Bill is to incorporate and confer powers on a Company originating as a limited Gas Company in 1850, and taken over in 1897 by a concern called the Leatherhead Gas and Electric Lighting Company, Limited. The capital now consists of shares amounting to £19,380, and £4800 borrowed money. The area of supply is defined, and comprises the parishes of Leatherhead, Mickleham, Great Bookham, Little Bookham, Headley, and Fetcham, in Surrey. The capital of the Company is to be increased to £40,000, with one-fourth borrowing powers. The maximum price of 15-candle gas is to be 5s. per 1000 cubic feet, with 10 per cent. as the maximum discount. Power to specify and inspect gas-fittings is sought. Five per cent. interest is to be allowed on consumers' deposits.

The Long Eaton Gas Bill is to incorporate a Company, formed in 1864, who obtained a Provisional Order in 1880. The existing capital consists of £16,000 original, and £14,000 additional share capital, fully paid; and there is a mortgage debt of £6000. The area of supply covers the parishes of Long Eaton, Breaston, Draycott, Risley, and Sawley, in Derbyshire. The proposed capital is £118,200 in 5 per cent. ordinary stock, of which £66,600 is to be raised under the Act. Fourteen-candle gas is to be supplied at the standard prices of 5s. 2d. per 1000 cubic feet within the township of Long Eaton, and 6s. 2d. beyond. In case consumers' accounts are left unpaid over one month, it is proposed to levy a fine of 1d. per 1000 cubic feet of the amount charged for. Consumers' pipes are to be specified and inspected. The Company desire to be enabled to purchase, take on lease, or build residences for their employees.

The Omagh Gas Bill is to dissolve and reincorporate a Company formed in 1850 for the supply of gas within the township of Omagh, in the county of Tyrone. In 1879, the capital of the Company consisted of £5000; and since then the amount has not been increased. But all the annual profits of the undertaking over the sum required to pay a dividend at the rate of 5 per cent., have been applied towards the construction and renewal of the works, which are now stated to be worth £15,000. The area of supply is to be confined within a radius of 2½ miles from the centre of the existing works. The capital is to be increased to £30,000, whereof £15,000 is to be original stock; all bearing a 5 per cent. dividend. The loan capital is to be in the proportion of one-third. The initial price for 15-candle gas is to be 5s. per 1000 cubic feet, with discounts not exceeding 2d. per 1000 cubic feet. The Company desire permission to make application for an Electric Lighting Order; using their own land for the purpose of generating electricity.

The Otley Gas Bill is to incorporate a Company formed in 1866. Provisional Orders were obtained by the Company in 1889 and 1893. The share capital consists of £20,000 original capital, £4600 additional capital, and £6875 borrowed money. A sum of £3051 has been received as premiums and has been expended in improving the works. The area of supply is defined to include the townships of Otley, Newall-with-Clifton, Farnley, and Weston, in the West Riding. The capital is to be converted into 5 per cent. stock, and increased by £16,000, with one-fourth borrowing powers. Directors are to be relieved from disability for office in the event of their being contractors with the Company. The initial price of 15-candle gas is put at 3s. 6d. per 1000 cubic feet. Discounts up to 20 per cent. are to be sanctioned.

The Petersfield and Selsey Gas Bill is to make provision for a better supply of gas to a district on the borders of Hampshire and Sussex. The undertakings of the Petersfield Gas, Coke, and Oil Company, Limited, and the Selsey Gas and Lighting Company, Limited, are to be acquired, to form the basis of the proposed new Petersfield and Selsey Gas Company. The capital is to be £30,000, with one-third loan. The maximum price of gas is to be 6s. per 1000 cubic feet, and the quality 15 candles. The Company seek permission to make application for an Electric Light Order.

The Stratton and Bude Gas Bill is to incorporate a Company for the purpose of supplying gas to a district on the north coast of Cornwall. The capital is put at £20,000, with one-third loan. There is a Directors' and Contractors' disqualification removal clause, as in other Bills already referred to. The maximum price of 14-candle gas is to be 6s. per 1000 cubic feet. On consumers' deposits, 3 per cent. interest is to be paid.

The Swanage Gas and Water Bill is to incorporate a Company for the purpose of taking over the undertaking originally established by the late Mr. George Burt, for supplying the town of Swanage, Dorset, with gas, and since his death carried on by Trustees. The gas capital of the Company is to be £35,600, of which £13,320 is the original capital. Certain back-dividends are to be payable. One-third loan capital is asked for. The old Trustees are combined with the new proprietary. The maximum price of 14-candle gas is put at 6s. per 1000 cubic feet.

GAS UNDERTAKINGS RETURNS.

The returns relating to gas undertakings of the United Kingdom for the year ending Dec. 31, 1899, in the case of the Companies, and March 25, 1900, for the Local Authorities, were issued last Tuesday, pursuant to an order of the House of Commons dated the 26th of April last. The returns for 1898-9 were not ordered till the 7th of August, and were not published till Jan. 31, 1900. The present returns, therefore, appear a month earlier than their immediate predecessors, and rather nearer the date of prior issues. The information furnished in regard to the Companies is set out in 27 columns; that relating to the Local Authorities being brought into 23 columns—the headings in each case being the same as last year. Particulars are given in regard to 450 authorized gas undertakings in the hands of Companies, as compared with 439 before—an increase of 11, all, with one exception, being in England. The new comers are the Bedworth, Cobham, Crowborough, Farnham, Fishguard, Freshwater, Herne Bay, Limavady, Newtown and Llanllwchaiarn, Rushden and Higham Ferrers, St. David's, and Shirebrook Companies. The Morley undertaking drops out, and appears again among the Local Authorities (in which it figured last year for a period of three months), from whom there are 232 returns—an increase of 10. The fresh entries are Ashburton, Brigg, Clacton, Leigh-on-Sea, Market Harborough, Skipton, Wallingford, and Yeovil, in England, and Invergordon and Drogheda in Scotland and Ireland. The amount of capital authorized for the 682 gas undertakings is £114,591,214, of which £99,046,880 has been paid up and borrowed. The previous amounts were £96,209,668 and £82,109,752. The receipts on revenue account are £23,562,789, compared with £21,270,795; and the expenditure is £17,634,167, against £15,675,943. The capital authorized for gas undertakings in the hands of both Companies and Local Authorities includes other purposes in certain cases. The statistics relating to working show that the quantity of coal and cannel carbonized in the period covered by the returns was 13,610,688 tons; the bulk of gas produced being 147,155,557,421 cubic feet, of which 135,721,696,079 cubic feet were sold—including 10,077,026,210 cubic feet of water gas and 75,239 cubic feet of acetylene gas. The previous totals of working results were: Coals, 12,841,817 tons; gas made, 138,146,994,782 cubic feet; gas sold, 127,365,376,845 cubic feet—including 7,404,193,550 cubic feet of water gas and 82,550 cubic feet of acetylene gas. At the dates to which the last returns were made up, there were 26,807 miles of mains in use for the supply of 3,485,557 consumers and 581,206 public lamps. The previous figures were: Miles of mains, 25,481; gas consumers, 3,249,138; public lamps, 566,864.

As in the returns for the year 1898-9, particulars are furnished as to the nature and quantity of materials other than coal used for the manufacture of gas, the supply of water gas, and the maximum proportion of its admixture with coal gas. The extent to which oil, petroleum spirit, carburine, or "other material," is now utilized for the production of gas will be seen from the following list of Companies and Local Authorities who make returns in regard thereto:—

Companies.

Bath	Epsom and Ewell.	North Middlesex.
Bexhill.	Exeter.	Norwich (British Co.).
Bournemouth.	Falmouth.	Plymouth.
Brecon.	Folkestone.	Preston.
Brentford.	Gaslight and Coke.	Quorndon.
Bridlington.	Godalming.	Scarborough.
Brighton.	Gravesend.	Snodland.
Bristol.	Guildford.	Southend.
Broadstairs.	Halesowen.	South Metropolitan.
Canterbury.	Harrow.	Staines and Egham.
Chigwell.	Hastings.	Swansea.
Colchester.	Hornsey.	Swindon (New).
Commercial.	Horsham.	Taunton.
Croydon.	Hoylake.	Tottenham.
Crystal Palace.	Huyton and Roby.	Tunbridge Wells.
Derby.	Isle of Thanet.	Tynemouth.
Dorking.	Kingston-on-Thames.	Waltham Abbey.
Dover.	Lea Bridge.	Wandsworth and Putney.
Dublin.	Liverpool.	Watford.
Durham.	Maidenhead.	West Ham.
Eastbourne.	Maidstone.	Winchester.
Eccleshill.	Musselburgh.	Windsor (also Eton).
Ely.	Newport (I.W.).	Yarmouth.
Enfield.	Northfleet.	York.

Local Authorities.

Alva.	Dumfries.	Paisley.
Ardrossan.	Edinburgh.	Peebles.
Belfast.	Glasgow.	Portsoy.
Birkenhead.	Greenock.	Rochdale.
Birmingham.	Hereford.	Rotherham.
Blackburn.	Huddersfield.	Southport.
Broughty Ferry.	Ilkeston.	St. Helens.
Bury.	Keighley.	Stockport.
Chorley.	Leicester.	Stockton-on-Tees.
Coventry.	Manchester.	Tipton.
Darlington.	Middlesbrough.	West Bromwich.

The new names in the above lists are the Bexhill, Brecon, Chigwell, Dorking, Durham, Eccleshill, Enfield, Epsom, Falmouth, Halesowen, Harrow, Horsham, Kingston-on-Thames, Maidenhead, Northfleet, North Middlesex, Plymouth, Quorndon, Scarborough, Tynemouth, Wandsworth and Putney, and York Companies; and the Local Authorities at Leicester, Tipton, and West Bromwich. On the other hand, Bromley, Dundalk, Longwood, Mitcham, Richmond, Rochester, and Tonbridge drop out of the Companies' list, and Alloa, Ashford, Colne, Padiham, Perth, and Smethwick out of that of the Local Authorities. There has apparently been a change in the process of manufacture at Portsoy, where "11 tons of carbide of calcium" are returned, as compared with carbide and oil last year. There were 96,690 cubic feet of acetylene gas made, of which 57,509 feet were sold for private consumption and 17,730 feet for the public lighting—together, 75,239 cubic feet.

With regard to carburetted water gas, the returns show that when they were made up it was being supplied by the following

Companies and Local Authorities; the maximum proportions of ts admixture with coal gas being given in parentheses:—

Companies.

Bath (50).	Folkestone (25).	Plymouth (40).
Bexhill (44·75).	Gaslight and Coke*	Preston (40·2).
Brentford (37).	Guildford (25 to 33).	Scarborough (38).
Brighton (av. 18·79).	Harrow (45).	Southend (av. 40).
Bridlington (25).	Hastings (av. 23·20).	Swansea (25).
Colchester (23·43).	Hornsey (50†).	Swindon (New) (20·9).
Commercial (43).	Horsham (30).	Taunton (33·33).
Croydon (av. 28·7).	Hoylake (24).	Tottenham (50·91).
Crystal Palace (29·5).	Liverpool (50).	Wandsworth (13).
Dorking (50).	Lea Bridge (34).	Winchester (30).
Durham (30).	Maidenhead (40·32).	York (18·42).
Epsom (30).	North Middlesex (30).	
Falmouth (33·33).	Norwich—British (59).	

Local Authorities.

Belfast (41·5).	Coventry (47·33§).	Paisley (2·57).
Birkenhead (40·67—7·56‡)	Edinburgh (11·24).	Southport (33).
Birmingham (25).	Manchester (11·95).	Stockport (24·87).
Blackburn (25).	Middlesbrough (33).	Stockton-on-Tees (10).

* The Company supplied 2,965,564,000 cubic feet of water gas. Of the total quantity of gas sent out, 21 per cent. was unmixed with water gas. With regard to the remainder, 67 per cent. contained a maximum proportion of 16 per cent. of carburetted water gas, 12 per cent. a maximum proportion of 29 per cent., 10 per cent. a maximum proportion of 35 per cent., and 11 per cent. a maximum proportion of 39 per cent. † On a few days only. ‡ Maximum and minimum figures. § On one day only.

Since the previous returns were issued, the number of Companies furnishing particulars as to water gas has increased by eleven; and that of the Local Authorities by one. The new Companies are the Bexhill, Crystal Palace District, Epsom, Folkestone, Harrow, Horsham, Hoylake, Scarborough, Taunton, Wandsworth, and York; and the Local Authority is Paisley.

Comparing the figures furnished by the present returns with those contained in similar returns for the previous nine years, it will be seen that the Companies show as follows:—

Year.	Share and Premium Capital Paid up.	Loan Capital Issued.	Capital Sold under Auction Clauses.	Premiums Realized.
1890. . .	£32,884,026	£6,568,676	£4,008,465	£1,765,557
1891. . .	34,282,164½	6,862,117	4,300,266	1,823,068
1892. . .	35,266,898½	7,149,367	4,755,597	2,144,619
1893. . .	36,491,562½	7,544,563	5,417,667	2,432,970
1894. . .	37,059,199½	7,739,678	5,715,024	2,637,019
1895. . .	37,307,330½	7,888,086	5,974,455	2,779,604
1896. . .	41,433,325	8,185,710	6,783,468	3,512,818
1897. . .	42,368,976	8,891,218	7,248,545	3,405,345
1898. . .	44,134,488	9,360,293	7,786,216	3,995,781
1899. . .	57,937,016	11,151,134	10,031,384	4,301,820

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1890. . .	6,618,460	67,214,546,500	1,153,989	275,611
1891. . .	7,071,161	70,953,927,023	1,180,333	282,761
1892. . .	7,119,189	72,178,028,396	1,213,322	288,021
1893. . .	6,995,125	71,050,955,154	1,225,253	296,910
1894. . .	7,128,126	72,610,842,498	1,266,943	295,787
1895. . .	7,531,131	77,245,618,489	1,339,712	302,015
1896. . .	7,681,770	80,015,323,004	1,439,272	308,180
1897. . .	7,963,465	84,040,175,901	1,549,627	314,451
1898. . .	7,958,669	86,705,722,752	1,670,847	319,007
1899. . .	8,321,187	91,794,898,282*	1,817,649	324,166

* Number of cubic feet sold, 84,752,030,520, including 7,121,198,000 cubic feet of water gas.

The somewhat similar figures for the Local Authorities are—

Year.	Amount Borrowed, including Annuities (not deducting Repayments).	Receipts.	Expenditure (exclusive of Amount in the next Column).	Interest, &c., Paid.*	Net Profit after Payment of Items in preceding Column.
1890-91 .	£21,891,655	£5,628,212	£4,231,643	£956,183	£460,608
1891-92 .	22,476,180	5,906,319	4,589,109	965,533	397,947
1892-93 .	22,734,556	5,983,359	4,702,179	994,517	305,040
1893-94 .	23,619,082	6,219,460	4,866,486	1,038,462	341,470
1894-95 .	24,624,554	6,402,046	4,681,035	1,114,014	622,366
1895-96 .	25,624,326	6,478,191	4,881,944	1,126,170	493,886
1896-97 .	26,561,689	6,639,342	4,989,283	1,136,789	534,390
1897-98 .	27,376,324	6,759,883	5,058,705	1,161,171	554,014
1898-99 .	28,614,971	7,177,670	5,365,995	1,219,771	625,780
1899-00 .	29,658,730	8,018,089	6,155,725	1,280,168	663,189

* These figures include: (1) Interest paid on loans; (2) amount paid for annuities; (3) amount of loans repaid; (4) amount paid for redemption of annuities; (5) amount placed to sinking fund.

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1890-91. .	3,623,967	35,796,491,799	1,143,289	184,773
1891-92. .	4,148,131	37,740,332,448	1,172,704	192,323
1892-93. .	3,977,291	39,303,250,095	1,203,574	201,484
1893-94. .	4,025,167	39,730,833,247	1,226,332	210,316
1894-95. .	4,191,175	41,684,838,142	1,257,274	217,069
1895-96. .	4,406,315	44,176,134,202	1,320,059	224,873
1896-97. .	4,614,969	47,026,280,408	1,406,456	232,464
1897-98. .	4,652,688	48,652,558,526	1,475,749	239,352
1898-99. .	4,883,148	51,441,272,030	1,578,291	247,857
1899-00. .	5,289,501	55,360,659,139*	1,667,908	257,040

* Number of cubic feet consumed, 50,969,665,559, including 2,955,828,210 cubic feet of water gas and 75,239 cubic feet of acetylene gas.

ELECTRIC LIGHTING MEMORANDA.

Tramways and Magnetic Observatories—An Uncaptured Motive Force—Costs of Central Station Working in 1899.

THE deadlock in regard to the starting of the United Tramway Company's electric traction service in the extreme West of London continues unrelieved at this hour; and professional interest in the matter is becoming intense. We left the subject last week with Professor Rucker, whose suggestion for overcoming the difficulty was that the Tramway Company should bear the cost of removing the most delicate elements of the Kew Magnetic Observatory to some unnamed site where stray traction currents of electricity are not likely to be met with. Inasmuch as most interests in this world have a monetary basis—scientific observation of cosmic forces not excepted—this overture seems to lead directly up to the executive query, How much? When matters arrive at this point, they are usually in a fair way for getting settled. Hereupon "The Times" struck in, and made a well-intentioned effort to re-state the gist of the trouble between abstract science, represented in this instance by Kew, and applied science, represented by the Tramway Company. Thus posed, the question ceases to rest wholly upon the particular interests involved in this case, which is an advantage. Magnetic observatories are desirable things, no doubt; but that is not to say that they are to enjoy a monopoly of consideration. As well contend that wherever a big telescope happens to be set up for the purpose of studying the marks on the surface of the planet Mars, all building operations in its vicinity should be prevented, lest smoke should obscure the atmosphere. Neither astronomical telescopes nor magnetic instruments of great delicacy are in their right place in the neighbourhood of great towns; and it is hard to say why one particular concomitant of such localities rather than the others should be chargeable with the whole cost of changing a venue that has grown unsuitable, for one that will better answer the main purpose of science.

The outskirts of London want electric tramways; of that there is no question. Magnetic observatories, and gas and water mains in the highways, must make their account with this fact of the times. To do them justice, the owners of gas and water pipes have nowhere been unnecessarily fussy about the danger of electrolysis. If anything, indeed, they have usually been almost over-trustful in the ability of the Board of Trade to protect their property. They recognize that they are in the roads for their own and their customers' interests; and they are too wise to think of playing "dog-in-the-manger" as regards the user of the surface. Yet their monetary interest, and even the interest of public safety, in the integrity of their mains and pipes, far transcends anything that can be pleaded by the Kew philosophers. We would not be misunderstood as depreciating the value of continuous observations of the earth's magnetism, and its variations. It is true that no money value can be put upon such records, and that no utilitarian aspect for them can be imagined for the present. But all value cannot be expressed in pounds, shillings, and pence; and the key to the mystery of the earth's magnetism may be found at any moment. As Professor Perry has said, if we could only get hold of the merest fraction of the energy of the earth's motions in space, and harness it to our machines, the question of motive power and fuel would cease to trouble us and our successors. This cannot be done, for the present. All that the available portion of the earth's magnetism will do for us, until we have learnt to master it, is to influence a few delicately poised instruments; and these may as well be kept in one place as in another. Certainly, it seems absurd to cripple the means of locomotion of a large town population because they happen to be in one not specially desirable suburban spot.

The first number of the "Electrician" for this year contains instructive tables of statistics relating to the costs of carrying on municipal and companies' electricity supply works during 1898 and 1899. It is explained that the order of keeping separate the results of the working of municipal and companies' undertakings has been adhered to because of the essentially different forms adopted for rendering the accounts of the two classes of works, and also because the working methods differ. It is, of course, easy to draw misleading inferences from statements of averages; and we cannot see any sense in many of the averages worked out by our contemporary. For instance, what is intended to be understood by averaging the output in units of 52 municipal stations, regardless of population or anything else? There is no common measure between any two places that might be picked at random out of the table. The chief use of the statement appears to be that it gives a bird's eye view of the revenue and expenditure figures of the undertakings included, for use in making comparisons. One thing that appears prominently from the table is that just one-half of the undertakings listed managed to clear their heels, allowing 6 per cent. for capital charges. This, of course, means bare interest and redemption payments. Adding 2½ per cent. for the most modest of depreciation allowances, it appears that only half-a-dozen undertakings—to wit, Aberdeen, Bradford, Halifax, Hampstead, Huddersfield, and Leeds—made sufficient working profit to pay such a charge. This does not say that they actually did make the necessary allowance for depreciation; but they were apparently solvent to the requisite degree to permit of it. We have often expressed the belief that the really solvent municipal electric lighting undertakings of the country could be told on the fingers of both hands; and this statement bears us out. It is not

complete, however—such important stations as that of Leicester being omitted; and this must be duly allowed for. It is remarked by our contemporary that there is a gradual approach of the average total costs, *plus* 6 per cent. on the mean capital, to the total revenue. This means that no "profits" worth mentioning are made out of municipal electricity, which is sold at about cost price. In dealing with the companies' working, 7 per cent. profit is allowed on the total capital expenditure. With these allowances, although it is possible to pick out several municipal stations working at a lower cost than companies, yet the difference is neither large nor invariably in one sense. Besides, where the company does not pay its way, the shareholders suffer; whereas when a municipal undertaking is insolvent (as almost nine out of ten actually are), the ratepayers are responsible for it.

BOARD OF TRADE REPORT ON TRADE UNIONS.

In the last few days of 1900, we received from the Labour Department of the Board of Trade the annual report on Trade Unions in 1899. If that bald statement of fact is not sufficient to make the leisurely officials of the Department ashamed of themselves, we are afraid they are incapable of realizing the reflection cast upon their methods by this belated production of statistics. The following are some of the most interesting points in the report now before us, which, in addition to the figures for 1899, contains comparative statistics for 1892-8.

The membership of all the Unions at the end of 1899 was 1,802,518, as compared with 1,503,232 at the end of 1892—an increase of 299,286 in the seven (not, as the report says, eight) years. Of this increase, more than one-half (to be exact, 153,287 members) took place in 1899; and this marked accretion was largely due to the growth of Unionism among the coal miners, subsequent to the big strike in the South Wales district. In 1897, the total number of Trade Unionists among the Welsh coal miners was 22,058. This rose in 1898 to 75,806; and at the end of 1899 it was 111,365. Unionism, indeed, spread considerably in the latter year among the miners in all districts; the total increase in members being 71,084. Altogether, rather more than one-half of the miners employed in the United Kingdom are members of Trade Unions; the percentage being highest in Wales, and lowest in Scotland. Apart from this growth of Unionism among the coal miners, the average increase in membership from 1892 to 1899 is only equal to the rate of increase in population. The proportion that the total number of Unionists bears to the industrial population of the kingdom remains, therefore, practically stationary—which is to say, small.

It is estimated by the Labour Department that the proportion of men in the classes from whom Trade Unionists are drawn, who actually belong to Trade Unions, is, roughly, one in five; or, omitting agriculture (in which branch of industry the proportion of Unionists may almost be disregarded), one in four. In the case of women in factories and workshops, there are rather more than one in ten. These proportions are certainly not under-estimated. The complete organization of all workers, which is the dream of the agitators, and the specific for labour troubles prescribed so frequently by those who speak of things they do not understand, is, happily, no nearer its realization to-day than it was eight years ago.

The accounts of a hundred of the principal Unions (comprising 62 per cent. of the total membership of all the Unions) are tabulated; their income, expenditure, and funds in hand being shown in detail. The natural consequence of the fact that the year 1899 was remarkably free from trade disputes of any considerable magnitude, is seen in the growth of the accumulated funds of the Unions in that period. The total of these funds (we are speaking now of the hundred principal Unions) amounted, at the end of 1899, to £3,282,922, or 58s. 9d. per member, as against £2,698,422, or 51s. 9d. per member, twelve months earlier. At the end of 1893, the year of prolonged trouble in the coal trade, the figures were £1,381,813—equal to 30s. 4d. per head. The Yorkshire miners, who at the beginning of that year had in hand 59s. 7d. per member, had but 8s. 9d. at the end; while the Derbyshire and Nottinghamshire colliers were down, the one to 9d., and the other to 10d. per member. These three Unions, at the end of 1899, had balances equal to £3 7s. 4d., £3 17s. 1d., and £3 4s. 9d. per head respectively. By the 31st of December last, the figures had probably very considerably increased, as double subscriptions have been levied on the members in many cases. Sight should not be lost of these facts.

It is also to be noted that the Amalgamated Society of Engineers had, by the end of 1899, rather more than recovered the financial position which they occupied prior to the strike of 1897. On Jan. 1 that year, the accumulated funds amounted to £305,882, or £3 10s. 1d. per member. On Dec. 31, the figures stood at £152,677 and £1 13s. 5d.; the expenditure for the year being no less than £690,400, against receipts (and those nearly double the normal) of over £537,000. By the end of the dispute, in 1898, the funds were still further reduced. Nevertheless, the balance at the end of 1899 amounted to £307,168, equal to £3 12s. 4d. per man—the highest figures shown at the end of any year in the series of eight included in the report. In fact, it may be said that in the whole of the Unions in the metal, engineering, and shipbuilding trades, as well as in the coal trade, the balances in hand at the beginning of last year exceeded all previous records.

The analysis given of the amounts expended by the hundred Unions makes interesting reading. The percentage of the total expenditure paid away in dispute allowances in 1899 was very low; being only 9·4, as against an average of 21·4 for the eight years 1892-9, and a highest of 33·4 in 1897. The average percentage of the expenditure spent in "unemployed" and other benefits for the eight years in question was 59·8, and in working expenses 18·8; these expenses in 1899 amounting to no less than £323,519. Something over 3s. 6d., out of a total subscription of 30s. 7d., per member per annum seems a fairly heavy item for working expenses.

The dispute allowances in 1899 were heaviest in the building trade, being the highest on record; whereas in the mining and engineering trades, the payments on this account were insignificant, and the lowest recorded. Grants to unemployed members were lower than ever before; amounting to £191,000, as against £454,600 in 1894. That there is an intimate relation between the general condition of the trade of the country and this branch of Trade Union expenditure, goes without saying.

The sick and accident allowances—the provision of which constitutes the really beneficial and altogether praiseworthy side of Trade Unionism—mount up steadily, but do not equal the sums paid away in working expenses; representing, on the average, only 17 per cent. of the total expenditure, over a period of eight years. The best record is that of the Unions in the clothing trades; while the Building and Engineering Trade Unions also expend large sums in sick allowances. Only a comparatively small number of Societies pay superannuation benefits; but those that do are among the older and larger Unions. Old age alone does not in all cases entitle a member to claim this benefit. He must also be unable to work at his trade, or, at any rate, be incapable of earning full wages. The weekly payments made to members under this heading vary greatly in amount. Some are as low as 2s., a few as high as 12s.; but the more common amounts lie between 5s. and 10s. per week. The average sum paid in 1899 works out at 7s. 3d.

The proportion of superannuated members to membership is highest in the Flint Glass Makers' Union, in which it is as high as 10·4 per cent. In this particular case, however, the individual amounts paid are small, and members become eligible to receive the benefit after a comparatively short period of membership. In the engineering group, the proportion is 2·8 per cent.; the two Ironfounders Societies and the Amalgamated Engineers showing over 4 per cent. on the pension list. Advocates of old-age pension schemes often forget or ignore the many agencies already in existence to provide means of support to the infirm. The Trade Unions have some 10,000 pensioners on their books.

The detailed tables contain much interesting and some curious particulars. The fact was noted in the "Journal" some time since that the chimney-sweep was bitterly lamenting the damage done to his trade by the advent of the gas-cooker. This would appear to be borne out by the record of the membership of the Nottingham Chimney Sweeps' Union. In 1892, there were 125 members of this sooty fraternity; the number has steadily dwindled down from that to a bare 29. The Sheffield Lamplighters ceased to exist as an association in 1894. The London and Provincial Domestic Servants' Combination—always, one would think, rather difficult to organize, and totally uncalled for—died of inanition in 1898, after but a brief existence. Those of us who are householders, know well that the domestic servant can be a Trade Union in herself. Another short-lived organization was the Newcastle and Gateshead Lamplighters' Association, which came into existence in 1898, and passed out of it last year.

The Gas Workers' and General Labourers' Union showed an increase of membership in 1899; the total at the end of that year being 48,030, to compare with 43,474 at the end of the previous twelve months. The funds, however, were reduced from £8875 to £7015; the balance in hand at the beginning of 1900 being less than 3s. per member. Of the expenditure in 1899—£22,393—exactly 50 per cent. went in dispute allowances, no less than 41 per cent. in working expenses (or 3s. 9¾d. out of the average subscription of 8s. 6½d.), 7 per cent. in contributions to other Societies and Federations, while only 2 per cent. (£540) was spent in benefits to the members other than strike pay. The Union is, that is to say, a fighting organization solely; while the "working expenses" item leads one to suppose that the organizers do not make a bad thing out of it.

The Gas Workers, Brickmakers, and General Labourers' Union is only an affair of 4009 members (the number is diminishing, it was over 5000 in 1897); but the funds are proportionately more considerable than in the case of the larger Society—being equal to nearly 15s. per member. Here, again, the working expenses are very heavy, constituting 66 per cent. of the total expenditure, and eating up 4s. 9d. out of the 10s. 1d. subscribed per member. The payments for dispute benefits in 1899 were practically nothing—only £48. Sick and funeral allowances accounted for £260.

The conclusions drawn from the report as a whole are that Trade Unionism is not materially increasing its hold upon the working classes in this country, that a great deal of the men's money is spent in organizing the means of getting rid of still more, and that the existing Unions have, speaking generally, benefited financially to a considerable degree from the period of brisk trade and high wages through which we have been passing. Whether this financial benefit is to be thrown away in a hopeless resistance to the lowering of wages consequent upon a slackening of trade activity, remains to be seen.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 97.)

THE New Year had a most inauspicious opening on the Stock Exchange with the failure of no fewer than nineteen firms over the now notorious London and Globe Finance Company. Here, as in other catastrophes, the innocent were entangled with the guilty, and are entitled to sympathy; but it is to be hoped that the others may not be allowed to escape condign punishment. The markets in general, or most of them, have been darkened by this sinister affair; and people have been rather shy of dealing in quarters where they were not quite sure of the financial position. Almost everything was flat (though the closing prices were not the worst of the week), except Americans, which were remarkably buoyant. Consols and the gilt-edged division receded before the advance of money. A feature of the week was the announcements of Bank dividends which show that these institutions, favoured by a continuous 4 per cent. Bank of England rate, have had a good half year. The Bank Directors found on Thursday that they could no longer avoid raising the rate, and accordingly a 5 per cent. rate supplanted the 4 per cent. rate which had lasted since the 19th of July, or nearly six months. In the Gas Market, business was moderately active; but it was to a great extent restricted to dealings in the leading issues. The tendency in general was steady; and changes in quotation are few and slight. But Gaslight ordinary showed further signs of weakness; and from 96½, which was marked on the opening day, it gradually declined to 94½ on Friday, which was the lowest of the week, and the quotation was lowered one point. A little business was done in the secured issues; but prices were not remarkable. South Metropolitan was very quiet, making only a couple of bargains. But the price was stiff; and the quotation went up two points. Commercials were firm and unchanged. Next to nothing was done in London in the Suburban and Provincial Gas Companies; but locally one or two of the latter underwent change. The Continental Companies were quiet also, and quite unchanged. The undertakings situated in the remoter parts of the world presented no feature calling for special notice. The Water Companies had an uneventful period; and changes were few and slight.

The daily operations may be briefly summed up. Business in Gas was moderate with steady prices, except for a tendency to shrinkage in Gaslight ordinary, until Thursday, when South Metropolitan advanced 2. The next day Gaslight ordinary receded 1, after which no further change took place.

PERSONAL.

Mr. C. H. MURRAY, of the Ilford Gas-Works, has been appointed Foreman of the Bombay Gas Company's works.

Mr. G. WRIGHT, of Market Weighton, has accepted the managership of the Driffield Gas-Works. He was one of three selected candidates from a list of sixty-nine.

Mr. H. M'NAIR, jun., Manager of the Strathaven Gas Company, has been appointed Manager of the Renton Gas Company, in succession to Mr. W. Whyte, transferred to Rothesay.

The Gas and Electricity Committee of the Rochdale Corporation have resolved to recommend the Council to grant an honorarium of £150 to Mr. T. BANBURY BALL, the Gas Engineer, in recognition of his services in planning and carrying out the erection of the electrical station and other special works.

Mr. J. M. MACMORRAN has been appointed Secretary of the Buenos Ayres (New) Gas Company, Limited, and also of the South Barracas (Buenos Ayres) Gas and Coke Company, Limited, in the place of the late Mr. E. W. Layton. Mr. Macmorran has been for some time Assistant-Secretary of these Companies, and succeeds his personal friend of many years' standing.

Among the New Year honours we are pleased to notice that a knighthood has been conferred upon Alderman JOSEPH SYKES RYMER, who has been twice Lord Mayor of York, and is Chairman of the York Water Company. Another knighthood has been conferred upon Mr. HIRAM S. MAXIM, who, with the late Mr. Frank Clark, introduced their gas-carburetting apparatus.

Mr. G. HAMPTON BARBER, the new Secretary of the Birmingham Corporation Gas Department, will commence his duties on the 1st prox. We regret to learn that Mr. Edwin Smith, the retiring Secretary, has for the past five weeks been confined to his room by a serious affection of the eyes, which has prevented him from either reading or writing, though he has been able to attend to some matters of business. Happily, however, there was last week a slight improvement, which we sincerely hope may continue.

The funeral service in memory of the late Dr. POLE, F.R.S., was held at St. John's Church, Paddington, last Wednesday morning, the service being conducted by the Vicar (the Rev. G. S. Karney) and the Rev. G. H. Pole, son of the deceased. Among those present, in addition to the relatives and nearer friends, were Mr. A. G. Vernon Harcourt, F.R.S., who had been for many years associated with Dr. Pole as one of the Metropolitan Gas Referees, Mr. C. Vernon Boys, F.R.S., and representatives of the Institution of Civil Engineers and of various musical societies—deceased having, as our readers are aware, been skilled both in the theory and practice of music.

COMMUNICATED ARTICLE.

SOME SUGGESTIONS FOR A GAS SOCIETY.

"Let the century end in peace and unity!" besought the "JOURNAL" of Sept. 5, 1899, with reference to the proposal for the amalgamation of the two Societies representing the British gas industry. The new century has begun, and still finds divisions in the ranks of gas men, though one and all are fully agreed upon the obvious advisability of united forces. Though the prayer was not answered, as was hoped, in time to present one strong and representative front at the International Gas Congress, yet some progress has been made toward the desired end; and perhaps even the experiences gained at the Paris meeting may be conducive to the wished-for result. If the Nineteenth Century did not end in peace and unity, surely one may hope that the opening of the Twentieth will witness a united Gas Society. That the matter is in the air, is shown in more ways than one—by official recognition, by personal discussion, and by many references in the "JOURNAL."

The latest official move was the proposed examination, by a combination of Committees of the Institution of Gas Engineers and the Gas Institute (an unenviable and delicate task) into the question of selecting certain names of "traders" who might be admitted into any future Technical Society. It would seem that such a procedure might be obviated by re-drawing the lines on which a representative Gas Society might be established. And in choosing a name for such an Association, the simple and short title of "Gas Society" appears to offer some advantages. It is brief, and new, and comprehensive of engineers, managers, assistants, secretaries, and others. It avoids the pitfalls and misunderstandings of "Institution" and "Institute." It separates itself from buildings for technical instruction, combined with cheap amusement, and links itself to other learned and scientific bodies. It might be made up of five or six classes, commencing with students, then associates, associate members, members, fellows, and honorary fellows. The last class would, of course, include the names of those famous in the world's gas industry, and those of the yearly Presidents of foreign Gas Societies.

The fellows of the Gas Society would be those eminent in their calling, irrespective of whether they were so-called traders or not. Among them would, no doubt, be found the high and respected names of those around whom discussion has raged, when considering the question of joining together the two existing bodies. By such means the inclusion of the best and ablest men in the new Society would be assured, and that without acrimonious and bitter heart-burnings. The members should hold chief positions of responsibility, and be altogether disassociated from the mercantile part of the gas industry. Associate members, also unconnected with "trade," would be occupants of the less important positions of the gas profession. In these three classes of fellows, members, and associate members would be invested all the powers of corporate membership. The associates would consist of the traders, contractors, and persons connected with the gas industry through business occupations. Without them, no Society could be fully representative; and in many ways they could further its legitimate aims. Though not having voting powers (until raised to the distinction of fellowship), they are usually admitted by foreign Gas Societies to meetings and debates. In this way, they are attached to the Société Technique du Gaz, of whose organization and power and resources English gas managers had full evidence last September. One article in the French Society's regulations states that it is formed "to establish means for facilitating exchange of information and ideas, and to maintain *a spirit of brotherliness between all members of the Society*." In such a spirit should a comprehensive English Gas Society be formed.

It should not be overlooked that admission into a Gas Society—or, indeed, any other—must not be regarded as an end in itself, but only as a means to an end. There is too often a feeling of self-satisfaction on election—a feeling as though some final goal had been reached; whereas a soundly-established Technical Society should be so constituted as to stimulate progress, and encourage ambition. It should foster what is best in any member, and lead up to higher things and greater efforts. Do the two present Gas Associations do, or attempt to do, anything of the kind? Take the new Gas Society. The student should be guided, tutored, and finally examined, not only theoretically, but practically as well, and passed upward to the class of associate member, or if in trade to that of associate. The trader should be desirous of so organizing his affairs, and the contractor of so perfecting his appliances, as to merit election as a fellow, with the consequent full corporate rights. So, too, the member would endeavour to give of his best, both in his profession and in the Society, so as to qualify for a like honour as his "trading" brother. Thus all would be working heartily and harmoniously together for the common good of the same industry, fighting all antagonists, and protecting their mutual interest.

The funds from any such broad-based and generously-founded Society would be sufficient to justify something ambitious in its scope and management. With subscriptions ranging from half-a-guinea to three guineas, and adequate entrance fees, together with financial support that might be expected from gas companies and corporations, the long-desired experimental gas-works might

be established, which could only redound to the credit and benefit of all. Then might the reproach of lack of enterprise and study in the higher branches of technical research be removed from English Gas Engineers, and their heads be held higher, and their feet run surer in the universal race after improvement and knowledge. Its funds would enable a permanent meeting place to be procured—not a second or third floor back office—and a proper and comprehensive library be brought together, at the disposal of all classes of members. In a hundred-and-one ways would advantages arise, and the general tone and attractiveness of the gas *personnel* be improved, thereby commanding both greater respect and financial consideration.

The present District Associations, as often suggested, would then become attached to the Gas Society, carrying on its local work and influence, and encouraged and enlivened by one of its annual meetings being held in their neighbourhood in rotation. Many other points and considerations will suggest themselves; but the essential things to be remembered are that the time for something to be done is ripe, and that this something should be broad, generous, embracing, and final. Then, indeed, will "the century end in peace and unity."

NOTES.

A New Cement Test Wanted.

Herr M. Gary, of the Royal Technical Experimental Laboratories, Berlin, has recently reported upon the practical value of accelerated cement tests. Some years before, these tests, including the celebrated boiling test, had been reported upon; and notice was taken of the circumstance that some brands of cement in considerable vogue did not come out at all well under the tests. Further inquiry was therefore directed to ascertain whether the tests were misleading, or the cements bad. In some examples the cements were unquestionably unsatisfactory; but in others, works executed with them stood perfectly well, although the cements themselves failed under test. In one remarkable instance, a cement was strongly marked with cracks in the drying and heating tests, completely boiled away in the boiling test, and cracked on the surface and rim in pat tests in water after two years. It came out unusually well in actual practice in very heavy masses of masonry. Various engineers were asked to report upon the behaviour in actual structures of particular brands of cement which passed the standard test for soundness, but not the accelerated tests. They all came out fairly well. Four of the specified cements were used in building a municipal gas plant, especially a concrete gasholder tank. One of these cements was made by the wet process from white chalk, and was slow-setting and of standard fineness. All but one tension test was up to the standard. The drying test was generally passed; but the boiling test never. Other parcels were differently made; but they all completely answered their purpose. The inference drawn is that for rough and strong work cements which fail to satisfy the drying, heating, and boiling tests may yet be quite good. Even cements which do not come up to the standard requirements for strength can still be used to advantage in building. The one thing needed in the further study of cements, as Herr Gary thinks, is to find out exactly how much sand a cement will carry and yet give at the end of a definite period a definite strength. That would be a very much more useful kind of test than those at present in use. Obviously, a cement which is as good at 1 : 8 of sand, as another brand is at 1 : 6 of the same sand, is so much the better for the user. The ordinary tests do not show this quality.

Large American Gas Compressing Plant.

Certain references, in a "Note" given in the "JOURNAL" for Nov. 27 last, to a large gas-engine of 250-horse power recently constructed by the Premier Gas-Engine Company, having attracted the attention of Mr. Irvin Butterworth, the President of the Columbus (Ohio) Gas Company, he has come forward to show what his country can do, and has supplied us with a general description of a gas-engine of 1000-horse power which has been installed by the Central Ohio Natural Gas and Fuel Company at Lancaster (Ohio) for the purpose of pumping gas to Columbus, a distance of about 35 miles. The plant is the second of the kind in the United States; the other being at Wilcox (Pa.), delivering gas to Buffalo, about 90 miles from the station. The pressure of gas from some of the wells was very weak; and therefore it was necessary to employ artificial means in order to increase it. The compressor weighs altogether 530,000 lbs. It consists of four gas-engine cylinders, measuring 5 ft. 9 in. by 3 feet, and weighing 11,000 lbs. each. These are placed in tandem—two on either side of, and connected to, a crank-shaft 19 feet by 3 ft. 5 in. by 2 ft. 5 in., weighing 14,000 lbs. To this shaft are connected the pistons of the compressors, of which there is one on each side. The compressor cylinders measure 6 feet by 3 feet by 4 ft. 8 in., and weigh 6340 lbs. apiece. At the ends of the crank-shaft are placed two fly-wheels 13 feet in diameter, each weighing 38,000 lbs. The engine is capable of developing 1000-horse power, and when running at its normal capacity will deliver 12 million cubic feet of gas in 24 hours. The foundation consists of a solid concrete block 8 feet deep, in the bottom of which a number of steel rails have been embedded. The bed-plate of the engine is fastened to the foundation by means of bolts anchored securely in the concrete The buildings at the station consist of one main structure 82 feet by 30 feet. This is of plain wood covered with corrugated iron, and contains the compressor. It will be entirely lighted by electric incandescent lamps to prevent danger of explosion should leakage of gas occur through the bursting of a pipe or fitting. There is a smaller structure 43 feet by 14 ft. 4 in. placed at one side of the main building. This will contain a small gas-engine used for starting the large one, regulators, gasholders, gauges, &c. Besides this there is an office, about 150 feet distant from the main building, which will be used as a regulator and telephone station, by means of which the men at the pumps will be kept in constant communication with both the gas field and the city. The present site of the station was chosen for its vicinity to a good water supply. This is very important, as large quantities of water are necessary to cool the cylinders of the engine, as well as for the cooling of the gas after it leaves the compressors. This is done by means of two 8-inch lines laid in the bottom of the creek, and thereby insuring a continual flow of water over them. The temperature is brought back to normal before the gas is again allowed to enter the main line, thereby preventing injury to the pipes by undue expansion and contraction.

Gas-Heated Baths, and Ventilation.

The recent fatal accident in Hammersmith, due to the use of a gas-heated bath in a non-ventilated room, calls attention to the necessity for the exercise of care in the fixing of all apparatus for burning gas in large quantities. In the case in point, which was reported in the "JOURNAL" for Dec. 18 last, the Coroner's Jury found that death was due to "carbonic oxide" poisoning, though the report of the proceedings does not show how so definite a finding was arrived at. The room that had been converted into a bath-room, with a "Therma" (luminous flame) bath water-heater in it, measured only 8 ft. by 4 ft. by 8 ft., with a cubic content of 256 cubic feet, which is decidedly small for the purpose. It generally happens that fatalities from inhaling gas or the products of burnt gas occur in places of this description. Naturally, the occurrence has been seized upon by rival interests to serve particular ends; but the only point that needs attention is the necessity for ventilating all apartments in which gas apparatus of large consumption is used. It is not sufficient merely to provide a "pipe" to take the "fumes" away from the apparatus itself. Nobody can say whether such an expedient could be depended upon to always act properly. Attention should also be given to the warning of the smell of burnt or partly-burnt gas emanating from some kinds of apparatus, which generally proclaims the character of the ventilation.

Thermometric Effects of Welsbach Lighting in a Closed Room.

Some observations were made in October last with the object of ascertaining the effect of burning an incandescent gas-light in a closed living room not specially ventilated in any way. The house is situated in the neighbourhood of London; and the selection of the particular date—Oct. 14—was made because, although the weather was then turning cold, household fires had not been commenced for the season. Consequently, any alteration of the interior temperature during the evening would be referable to the gas lighting alone, the ordinary conditions of occupancy of the apartments by one to three persons remaining the same throughout. At 6 p.m. on the date named, the temperature of the air outside, at 4 feet from the ground, had fallen to 42° Fahr. The room windows having been closed at sundown, and the blinds drawn, the interior temperature at this hour was 56° at breathing level. The dimensions of the room are approximately 15 ft. by 15 ft. by 11 ft. high. It has a large square bay window, of five sashes, one door, and a fire-place, of which the register-flap was shut. The room is used as a dining-room, and is lighted by one No. 2 Kern-Welsbach burner hung over the table, which is ample illumination for all ordinary purposes. On the evening in question, the gas was lit at 5 o'clock. At 6.30 a wet and dry bulb thermometer standing on the mantelpiece, indicated 53·5° and 57° respectively, and a chemical thermometer (previously compared and found to correspond with the dry bulb of the hygrometer) marked 59° at the ceiling. It being a damp and chilly evening, there was every inducement to keep the door shut and make the room as snug as possible without a fire. During the evening the following readings were taken; the first in order being of the wet and dry bulb thermometer on the mantelpiece, the next of the thermometer at the ceiling-level:—

7.15 p.m.	52·5°	..	56·0°	..	59°
7.50	52·5°	..	55·5°	..	58°
8.50	53·5°	..	55·5°	..	58°
9.35	52·0°	..	55·0°	..	58°

From these readings of the thermometers, it appears that the effect of the Kern gas-burner on the temperature of the apartment was inappreciable. The room was losing heat all the evening, owing to the considerable difference between its air temperature and that outside, which remained at 42°, with rain. The room did not feel at all cosy, and there was not a sign of stuffiness or feeling of oppression due to the use of gas for lighting. So far from making any additional call on the ventilation arrangements of ordinary living rooms, therefore, incandescent gas lighting stands upon the same footing as incandescent electric lighting—that is to say, it makes no difference practically to the air of a room whether the light is in or out.

THE NEW GAS-WORKS AT SCHLIEREN, ZURICH.

C.—Railway Lines. Carrying and Storing of Coal. Carriage of Bye-Products.

(*Continued from p. 24.*)

Conveying Coal from the Stores to the Retorts.

The retort-house is immediately alongside the coal-stores (as is shown in Plate I.), and separated by a strong party-wall. As has been already mentioned, the floors of the three coal-store compartments are inclined planes at an angle varying from 25° to 32°. At this angle, the coal slides automatically; and tests have been made with coals of different sizes. Professor Stodola has highly praised the inclined floors invented by Herr Rothenbach, and has stated that his invention is much more practical than the funnel-shaped hoppers put up at Copenhagen. The inclined surfaces are joined together by a narrow platform, having rectangular openings, 25 cm. by 30 cm. (9·84 in. by 11·81 in.) every 2 metres (6 ft. 6¾ in.), through which the coal may be taken as wanted. The concreted passages, 2 m. by 2 m., made under the coal-stores, are principally used for the longitudinal cross conveyors. We have already mentioned the difficulties met, and the expenses incurred, in making these passages, which are for the most part under the subterranean water-level. Their length is 620 metres (nearly 678 yards). The shuttle conveyor, which is made on the Kreiss-Hamburg system, is carried in these passages on wooden sleepers, placed on solid concrete foundations. The conveyor, which consists of a narrow sheet-steel trough, 2½ mm. (0·098 inch) thick, is placed horizontally, and here and there is supported by oblique springs in ashwood. By means of a connecting-rod, a crank gives this trough a very quick swinging movement to and fro; and thus the coal which falls into it is pushed forward by a series of shocks. The travel of the coal is at the rate of 18 cm. (7·09 inches) per second.

The longitudinal conveyors have a capacity of 7·2 tons per hour; while that of the cross conveyors is double—*i.e.*, 14·4 tons per hour. Out of twenty-one troughs, six are 34·5 m. (over 113 feet), twelve are 17·5 m. (over 57 ft. 5 in.), and the three cross ones are each 25 m. (82 feet) long. The Kreiss shuttle conveyor is one of the simplest means of transport—solid, easy to work, requiring little power, and very little attention. According to tests made, 6-horse power is sufficient to carry 14·5 tons by two longitudinal troughs and one cross one. These conveyors have worked perfectly since the middle of November, 1898. In other similar installations, such as at Geneva, the men shovel the coal on to the conveyor from the stores; and the openings in the bottom of the stores are closed by wrought-iron covers, which attendants open in succession.

After various attempts, an arrangement was adopted which made the coal fall automatically through these openings, and thus avoided the labour of shovelling. This apparatus consists of a flat horizontal plate, somewhat larger than the discharge-opening, and placed a little below it. The coal remains on this plate by its natural angle of repose, which varies according to the kind of material. The coal reaches the edge of the plate, which can be varied, being moveable in a vertical direction, and adaptable to the angle of the natural slope of the different kinds of coal. The plate is supported at its four corners by vertical springs connected to a lever. As long as the movement of the plate continues, the coal rolls from each side. The quantity to be taken from the stores is regulated by changing the motion, or by altering the distance between the outlet-opening and the plate. The coal falls by itself from the four sides of the plate into the conveyor, when the to-and-fro movement is 7 to 12 mm. (0·276 to 0·472 inch). As soon as the motion comes to a standstill, no further coal falls. The mechanism for starting may be arranged in various ways. In our special case, the movement of the conveyor itself starts it. Coal distributors may be adopted in many different ways.

A chain of elevator-buckets carries the coal from the level of the cross conveyors to the tanks above the retort-benches (fig. 5). As the elevator is placed between the two benches, and as it is supplied with a flap-valve on the top, the coal may be distributed as desired, either on one or other of the sides, or on both together. (This elevator is shown in fig. 6.) The horizontal carrying of the coal from the elevator to the tanks is done by a conveyor, known as a "push-plate" conveyor, which, it is important to note, also works automatically. As indicated in fig. 7, it is made of a strong link-chain carrying plates at various points. This endless chain, the length of which is regulated by a special coupling screw, is supported by sprocket wheels. The plates, when in motion, slide on lengths of hard wood; while the empty ones return in an opposite direction on chain wheels. These push-plate conveyors are of the same power as the elevator—that is, 14·4 tons per hour, at a speed of 42 cm. (16·537 inches) per second. A drive by means of fixed and loose pulleys, worked by an electric motor, is sufficient to move all the longitudinal shuttle conveyors, ending at the same cross conveyor, which is also driven by the same means. Likewise, an electric motor and a drive, common to both, are used for the elevator-buckets and the push-plate conveyor. The power required is 8 horse. A general glance at the arrangements of coal transport shows that it is carried out entirely automatically, and without the slightest labour, from the stores to the retorts, and is effected, also, quite independently of the working staff.

The charging and drawing of the retorts will be explained under heading "D—Retort-Arches, &c."

We now come to the carrying of the coke from the retorts to the coke-house. The great size of the latter, especially as regards the height of its central portion, may perhaps lead to the supposition that an error in construction, or an extravagant expenditure, has been made. We must explain, therefore, that this building was used for the machinery-room at the Swiss Exhibition, held at Geneva in 1896; and that the town of Zurich was able to buy it under very favourable conditions, which were not likely to recur. During recent years, the stock of coke had had to be stored in the open, owing to lack of sufficient sheds; and it had reached the large amount of 500 waggon-loads. This caused a real loss, as the coke was exposed to all the inclemencies of weather, and thus deteriorated in quality. It being heaped up to a height of 8 metres (over 26 feet), also caused a great deal of unsaleable residue. The two outside portions of the house are used principally for storing

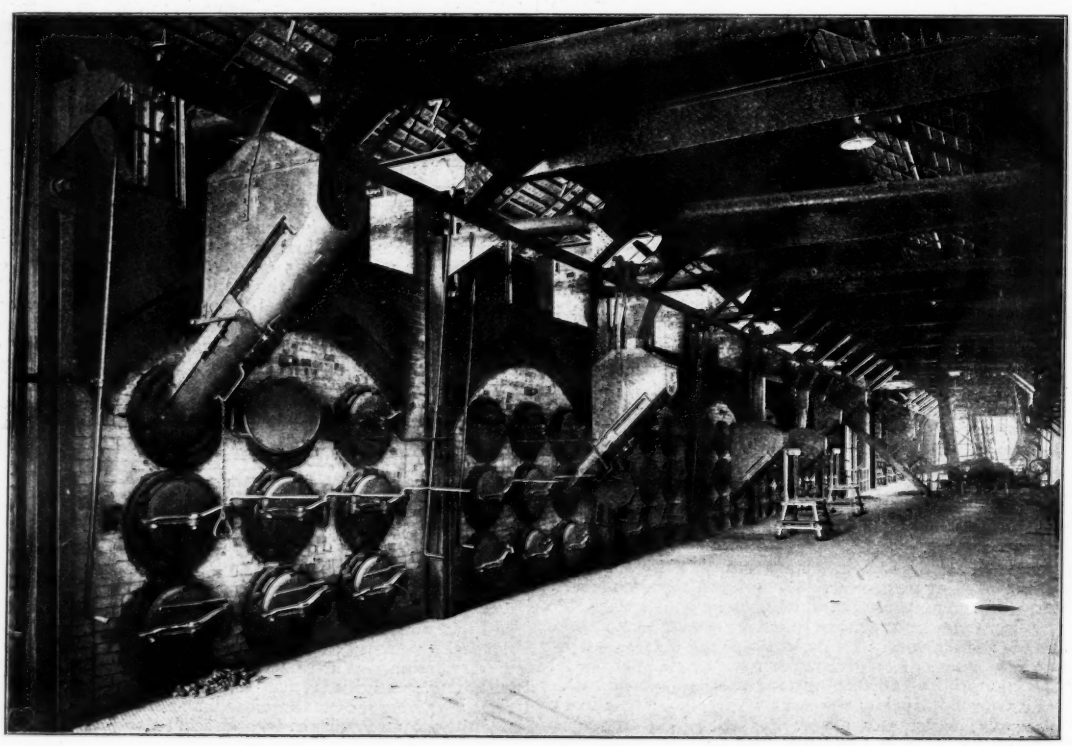


Fig. 5.—Charging-Stage of Retort-House.

and handling the coke. The central part is very useful as a store for all kinds of goods—such as pitch, graphite, purifying materials, fire-clay goods, &c.—and is used also for the manufacture of clinker bricks. The house, which measures 122 metres (400 feet) in length, is parallel to the retort-house, which is 150 metres (492 feet). The side portions of the house contain the junctions of the principal coke-conveyor between Benches I. and II. on one side, and Benches III. and IV. on the other. The conveyance of the coke from underneath the retort-house to the coke-store, is carried out in the two following ways.

(*a*) From Benches I. and II., the incandescent coke falls into large trucks by means of strong conical and rectangular iron hoppers, placed in front of the retorts (figs. 7, 8, and 9). These hold about two or three retort charges, or 260 to 280 kilos. (about 5 to 5½ cwt.) of coke. Under each hopper is a spray, which partly quenches the coke. The trucks are pushed by hand on a narrow-gauge railway (the plan of which, with points and turntables, is shown in Plate I.) up to the quenching place, where a second spray completes the extinction of the coke. Here it is thrown into a hopper from which elevator-buckets take it to the breaking and sorting apparatus. This is supported by a solid iron frame, and it also has a small electric motor of 5-horse power for driving it. The small coke or breeze, as well as the dust, falls from the hopper into an iron tank, which is closed at the bottom by slides. The large or broken coke falls directly into railway-waggons, or on to the conveying plant. A single apparatus, in fact, is used for both conveying and heaping the coke in the house. It is carried on a metal frame, and consists of a conveyor, which takes away the coke at the rate of 50 cm. (19·69 inches) per second, from the two sides, and which moves in the direction of the length of the house. This longitudinal conveyor is composed of three separate parts, each of which has an independent movement given it by an electric motor. The traverse conveying is done by a travelling bridge in I iron, running on four wheels, on which is an apparatus of the same form as that above described. One or two electric motors effect the movement of the travelling bridge and the conveyor. Hoppers with flap-valves placed at short spaces along the longitudinal conveyor, as also on the cross one, allow of the discharging of the coke at all parts of the house, either into sacks, or trucks, or into store. The capacity of the different plant for handling and conveying coke is from 15 to 20 tons per hour. Immediately on one side of the coke-breaker is a weighbridge (with stops upon it), on which are placed the waggons or trucks which are to receive a particular weight. The coke is brought to them directly by the conveyor already described.

(*b*) The coke coming from Benches III. and IV. is carried by a De Brouwer quenching apparatus and conveyor. This apparatus was known when Benches I. and II. were put up, but had not then been sufficiently tested. This was why it was not adopted for the first benches. Since then, these chains have been put up at the works at Brussels, Charlottenburg, Berlin, Cassel, and Winterthur, where they have worked satisfactorily. The tests made in these towns led to the arrangements adopted at the Schlieren works. We may here say that hot coke is one of the materials which causes most wear and tear; coal being in this particular much to be preferred. According to our experience, the extent of wear and tear between these two materials is in the proportion of from 1 to 10 to 1 to 20. The principal parts of a De Brouwer chain are a sheet-iron trough about 0·80 metre (31·5 inches) wide, and a flexible open chain. This latter is formed by two parallel link-chains joined together every 60 to 80 cm. (23·62 to 31·5 inches) by iron rods something like ladder rungs. The conveying chain rests in the trough already mentioned, and forms an endless chain carried either above or below by suitable guides. The two sides of the chain are made up of small links in forged iron, between which is left a space for taking the teeth of the gearing wheel. These two pliable chains pass round a sprocket-wheel, keyed on to a shaft, from which they receive regular motion. The trough is placed in the floor in front of the bench, and immediately below the retort mouthpieces, so that the drawn coke falls directly into it and on to the rungs above mentioned. The coke slides along with the moving chain; and at the end of the trough it falls on to a second similar arrangement, which carries it into the coke-house. In order to protect the chain and the trough, water is allowed to run into it, which partially extinguishes the coke. The complete quenching takes place in the second conveyor, where the trough form is deepened, and where a good quantity of water is collected, through which the coke passes.

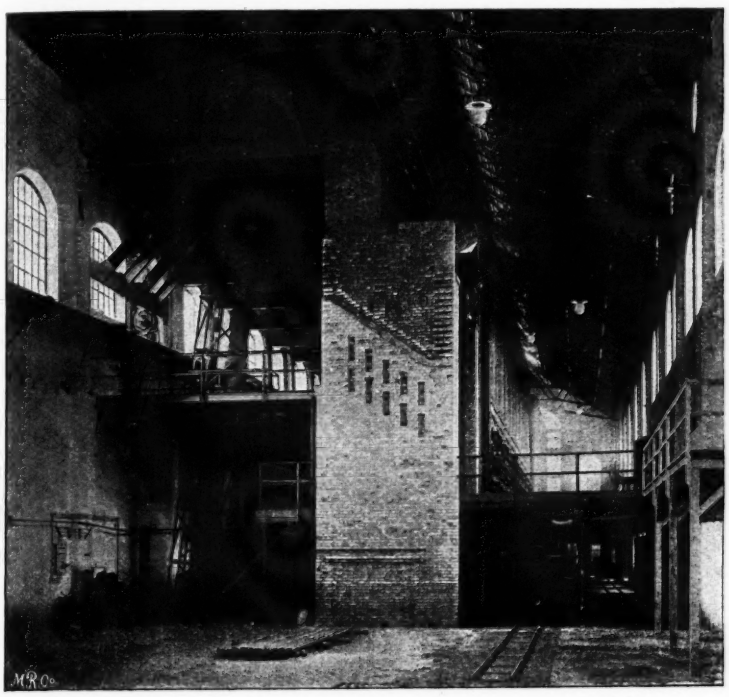


Fig. 6.—Bucket Elevator and Rail for Transporting Coke.

Professor Stodola has recently expressed himself in the following terms on the subject of the De Brouwer chain:—

> This new system of conveying fulfils in a complete way the desired end, inasmuch as the coke is carried away by the De Brouwer chain without shock or crumbling. The quenching is complete, and uses less water than in the ordinary way. Besides, this system of conveying allows the coke to be elevated without difficulty by an inclined trough, which offers the great advantage of doing away with elevator-buckets, which are certain always to produce wasteful crumbling of the material.

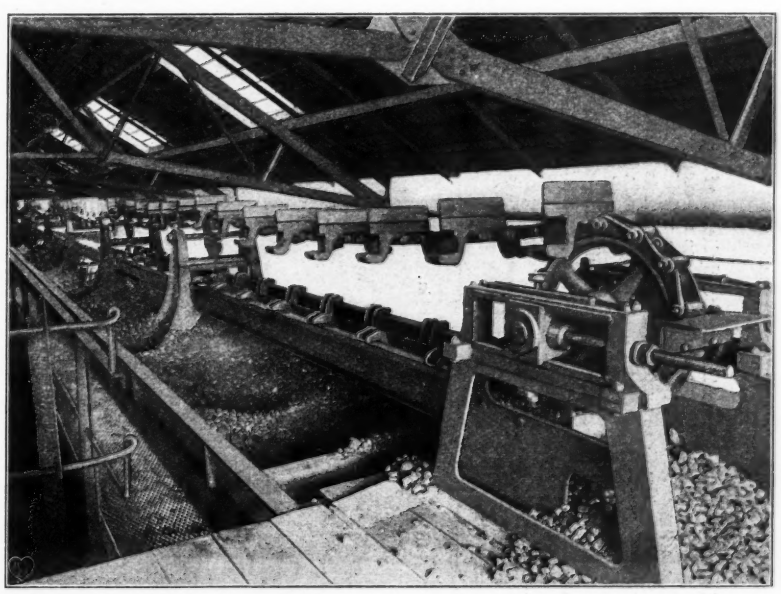


Fig. 7.—Scraper Type of Conveyor.

The cross De Brouwer chain leads the coke thus elevated to a screener with flap-valves, from which it may then be discharged as desired, as has been explained in connection with the other benches.

It ought to be mentioned, finally, that owing to these different installations a great economy has been made, and that, in addition, the fatiguing work of, and the sulphurous fumes that always arise from, quenching of the coke have been thus altogether avoided at the works.

D.—Retort-Arches and Other Apparatus.

Retort-Benches.

The erection of retort-benches is one of the most important and costly items of a gas-works; and the financial result of its working depends on the system of furnace selected. Profiting by the experience gained abroad, we have succeeded in reducing the fatiguing labour of the retort-house by adopting at Schlieren the Coze system of inclined retorts and Hasse-Didier furnaces. It seems probable that this system will for the future be used when building large gas-works. The retort-house—which is 150 metres (492 feet) long, 14·5 metres (47 ft. 7 in.) wide, and 12 metres (nearly 39 ft. 5 in.) high—contains four benches of eight beds each, and with nine inclined retorts in each bed. (Fig. 10 shows two of these benches complete.)

Eltr. Motor 12 h.p.	Electric Motor, 12 Horse Power.
Elevator, 14·4 Tonnen stündl.	Elevator to deal with 14·4 tons per hour.
Transmission zur Brouwer'schen Rinne.	Gearing of the De Brouwer Conveyor.
Brouwer'sche Rinne.	De Brouwer trough.
Eltr. Motor 5 h.p.	Electric Motor, 5 Horse Power.
0,70 6,00 3,00 5,55	2 ft. 3½ in. 19 ft. 8 in. 9 ft. 10 in. 18 ft. 2½ in.
11,95 5,475 4,13	39 ft. 2½ in. 18 ft. 13 ft. 6½ in.

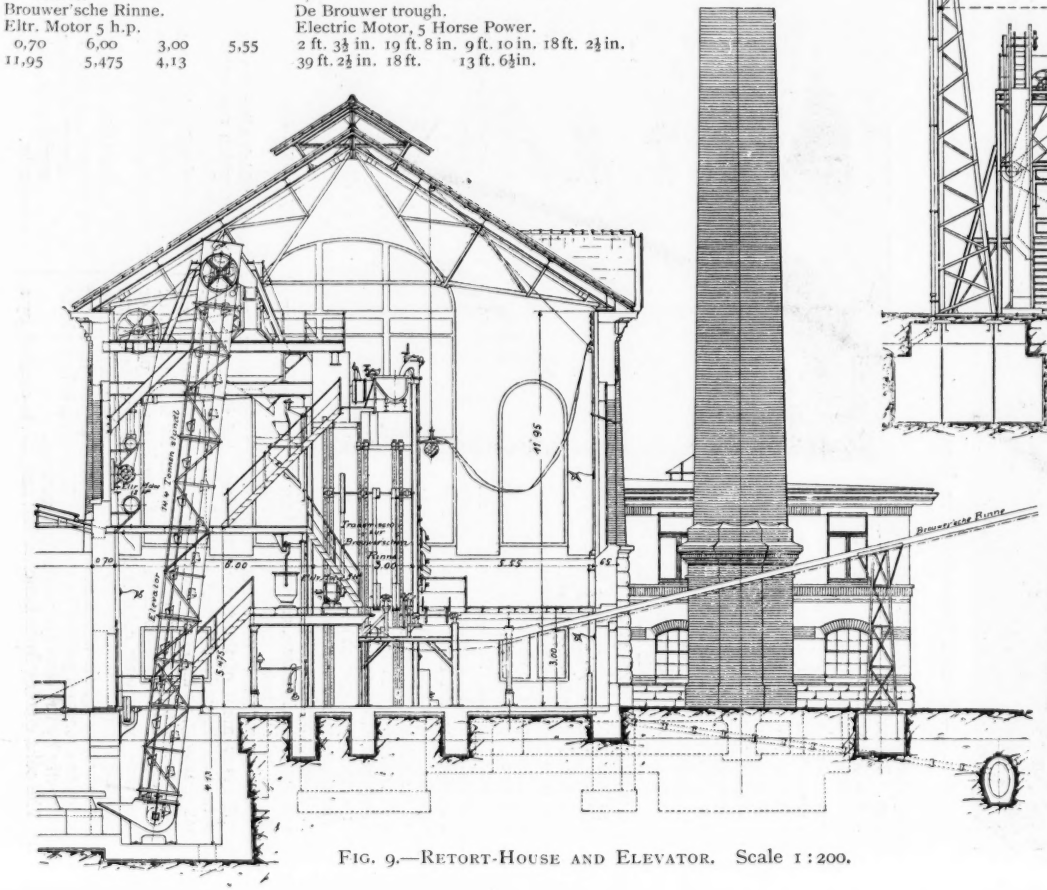


Fig. 9.—Retort-House and Elevator. Scale 1 : 200.

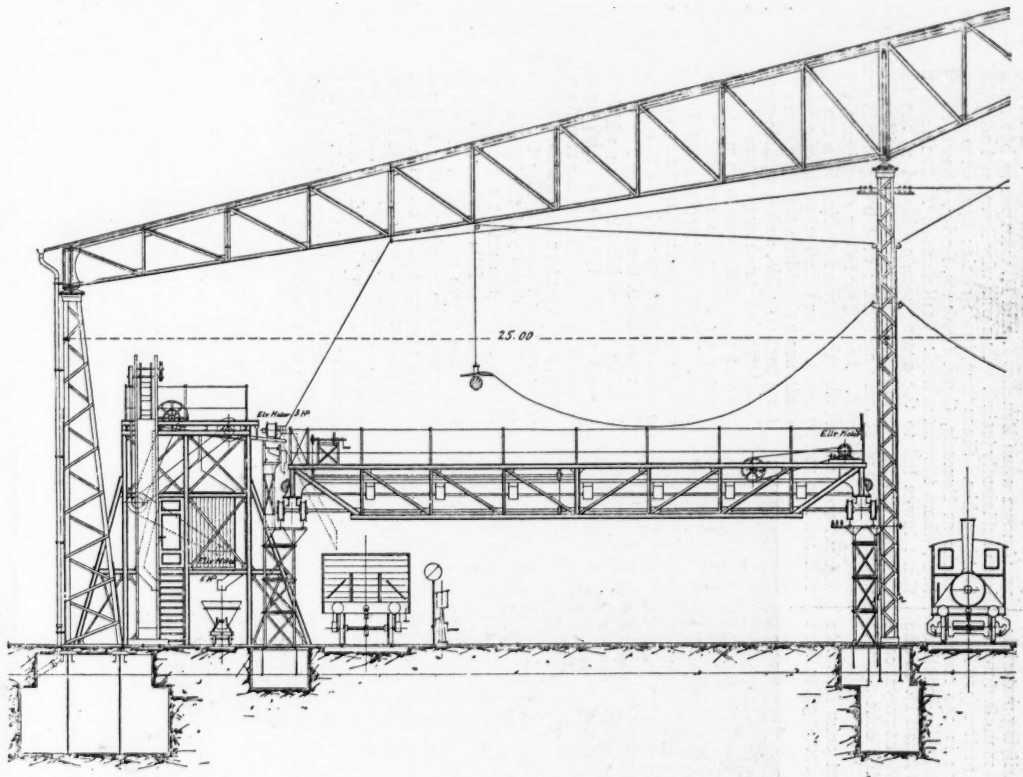


Fig. 8.—Coke-Sorting Plant, with Longitudinal and Transverse Conveyors. Scale 1 : 200.

These four benches can make 60,000 cubic metres (2,118,000 cubic feet) of gas, leaving at the same time a third in reserve. The retorts are 3·5 metres (nearly 11 ft. 6 in.) long, set at an angle of 32° for Benches I. and II., and 33° for Benches III. and IV. Each arch has its own producer. We calculated that each retort could make 250 cubic metres (8825 cubic feet) when carbonizing Saar and Ruhr coals; but we have even been able to get a make of 270 to 280 cubic metres (9531 to 9884 cubic feet) of gas per retort by fully charging them—without, however, overtaxing them.

As Switzerland does not produce any coal, the reserves of the works are not any too much in case of war or strikes. Taking as a base that one retort makes 250 cubic metres (8825 cubic feet) of gas, we have, for 25,000 cubic metres (882,500 cubic feet)—25,000 ÷ 250 = 100 retorts. Therefore, 200 retorts will make 50,000 cubic metres (1,765,000 cubic feet) of gas. By adding one third as a reserve, the number of the retorts would be 260. For the sake of symmetry in each bench, and as eight arches do not require any more men than seven, the number of the retorts has been increased to 288. In actual practice, our retorts make, on an average, 270 cubic metres (9531 cubic feet) of gas. Thus 222 retorts will make 60,000 cubic metres (2,118,000 cubic feet); so that 288 retorts give one-third in reserve.

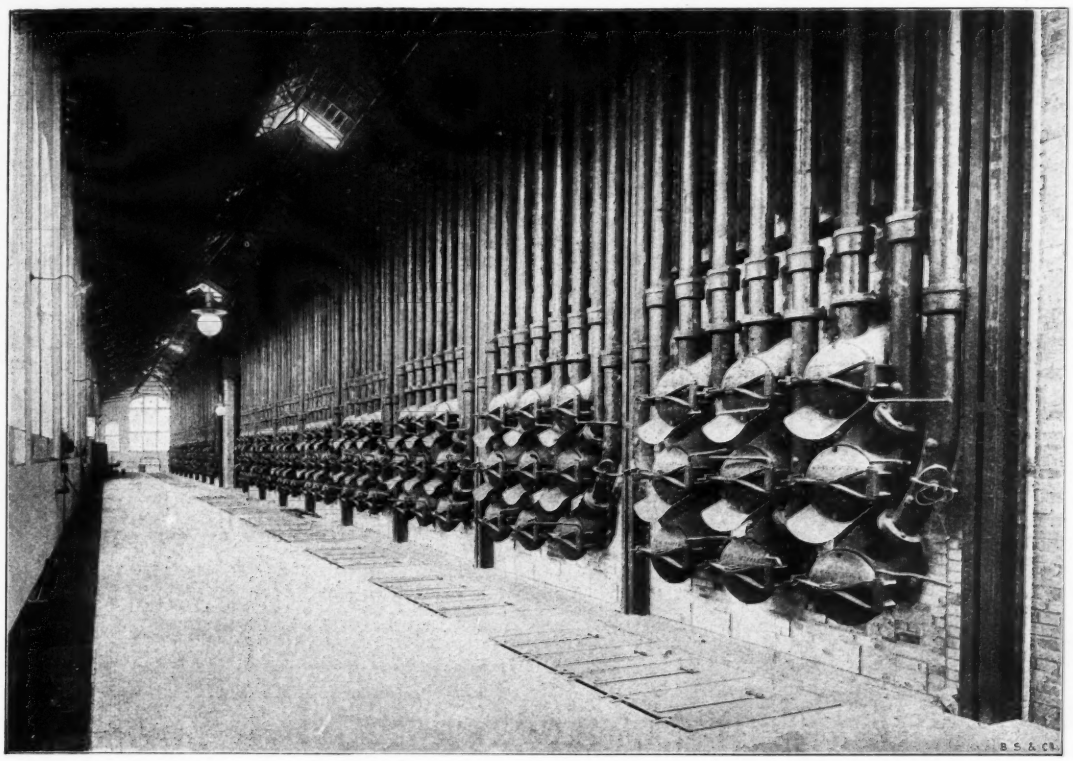


FIG. 10.—VIEW OF TWO BENCHES OF RETORTS FROM THE DRAWING STAGE.

The coal is stored in the longitudinal tanks placed at the back of the arches, as has been explained in speaking of the conveyors. These hoppers have been arranged to hold the coal required for 24 hours, reckoning one charge to be 250 kilos. (nearly 5 cwt.). The carrying of the coal required for 24 hours' working is done in 4½ or 5 hours. Each hopper at the back of each arch is provided with two discharge-openings of funnel shape, which are closed by means of slides. When these slides are opened by simply pulling the levers, the coal falls into a hanging shoot. The levers are worked from the charging-stage shown in fig. 5. The retorts are charged in a very simple way by the shoots made on the Coze patented system. Each horizontal tier of retorts is provided with a separate shoot. This arrangement is clearly shown in figs. 5, 9, and 11.

As has already been said, iron hoppers, closed by covers, are placed in front of the arches on the drawing stage, so that the coke falls directly from these hoppers into tip-waggons for Benches I. and II., and on to the De Brouwer conveyor for Benches III. and IV. (See fig. 9). The fuel required is brought to the producers by means of a suspended rail, the trucks for which are raised from the retort-house floor by an electric hoist. For Benches I. and II. a line, supplied with a turntable on which the large trucks are easily turned, leads up to the discharging place. The trucks are then emptied, and the coke falls directly into the smaller ones of the suspended rail, which are raised by the above-mentioned hoist, and stopped at the desired height above the flooring of the producers. For Benches III. and IV., the trucks of the suspended rail, having been lowered as required, are brought on a second aerial line underneath the rising part of the coke conveyor. Here the bottom of the De Brouwer trough is supplied with a slide, which, on being opened, allows the coke conveyed from the retorts to the coke-house to fall into, and fill, the hanging trucks, or eventually a tank (which is not shown on the drawings). The producers are fed every two hours. When the coke used is from Saar coals, clinkering every 24 hours is all that is required.

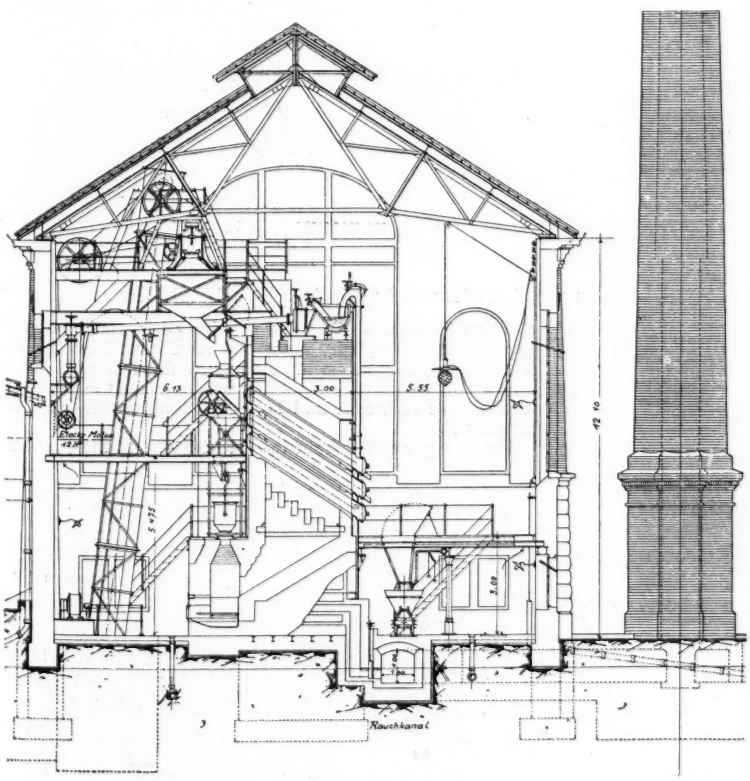


FIG. 11.—CROSS SECTION OF RETORT-HOUSE. Scale 1 : 200.

The hydraulic mains are provided with the latest improvements. They are supplied with valves for regulating the tar-level, with cleaning doors for taking out the thick tar without interrupting the working, and with the usual automatic deliveries for gas, tar, and ammoniacal liquor. The height of the hydraulic mains is arranged so that it can be regulated according to the extent of the expansion produced by the heat on the brickwork of the arches. A general collecting pipe in the open for each pair of benches leads the gas, tar, and liquor to the machinery building (condensers). This foul main, which is 450 mm. (about 17¾ inches) in diameter, is placed on brackets along the retort-house. It is designed for an hourly make of 1250 cubic metres (44,125 cubic feet), and so that the speed of the gas will not be more than 2·5 metres (about 8 ft. 2 in.) at the maximum. We may add that the main flue is placed in front of the arches; and that there is a chimney 37·5 metres (nearly 123 feet) high to each bench, which gives an excellent draught, and makes each bench independent.

Before leaving the retort-house, we must also notice its ventilation, which is obtained, in

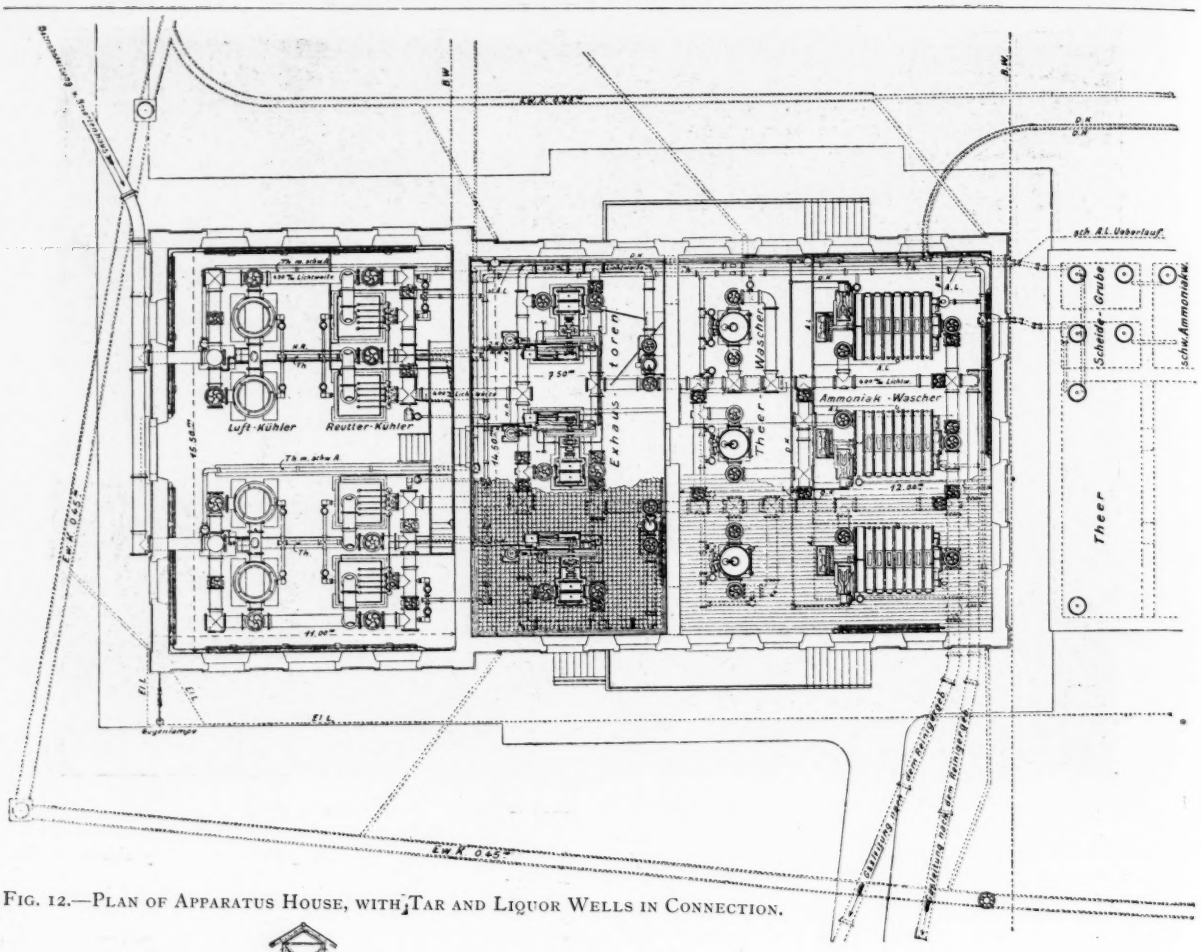


FIG. 12.—PLAN OF APPARATUS HOUSE, WITH TAR AND LIQUOR WELLS IN CONNECTION.

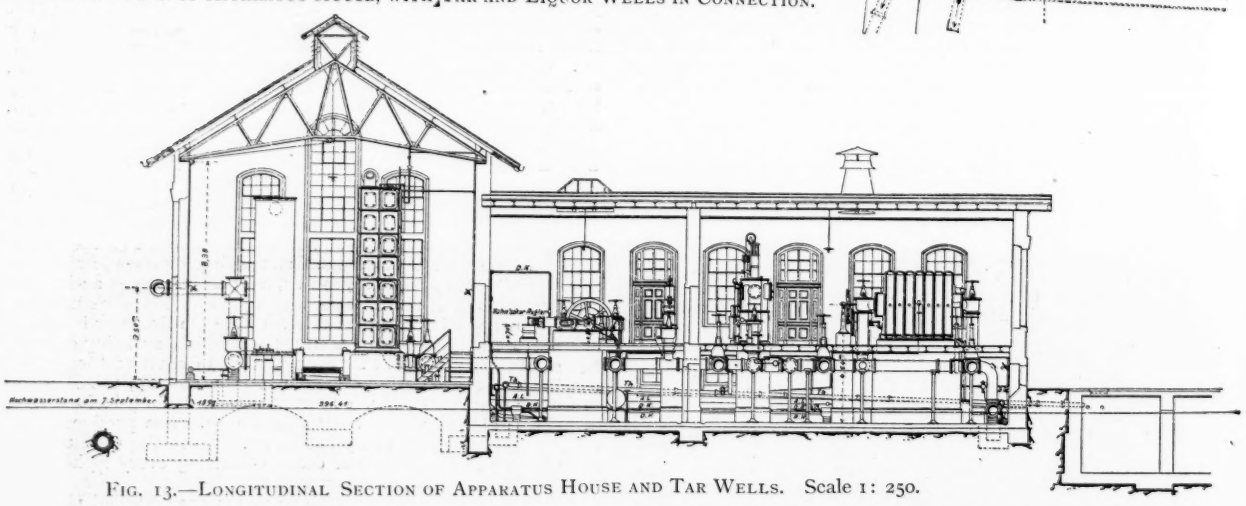


FIG. 13.—LONGITUDINAL SECTION OF APPARATUS HOUSE AND TAR WELLS. Scale 1: 250.

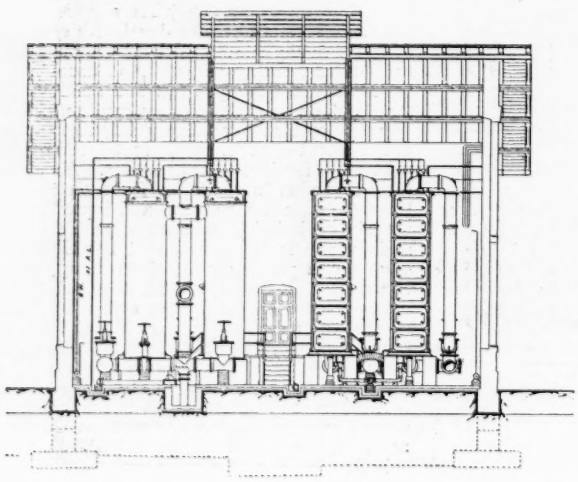


FIG. 14.—CROSS SECTION OF CONDENSER HOUSE.

addition to large wicket windows, by perforated plates, 80 cm. (31·5 inches) wide, fixed along the outside wall on the charging and drawing stages. A large annex, which is used for the workmen and superintending staff, is built against the middle of the retort-house (Plates I. and II.). We shall return to it under the heading F.

The foul gas is led from the retort-house to the condensers by

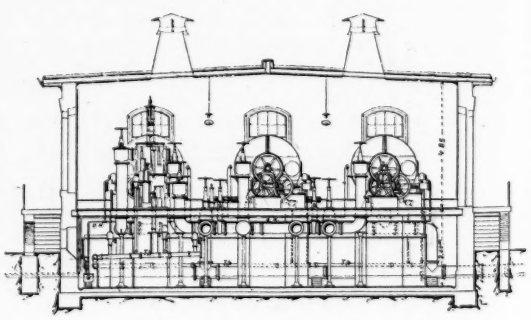


FIG. 17.—CROSS SECTION OF WASHER HOUSE.

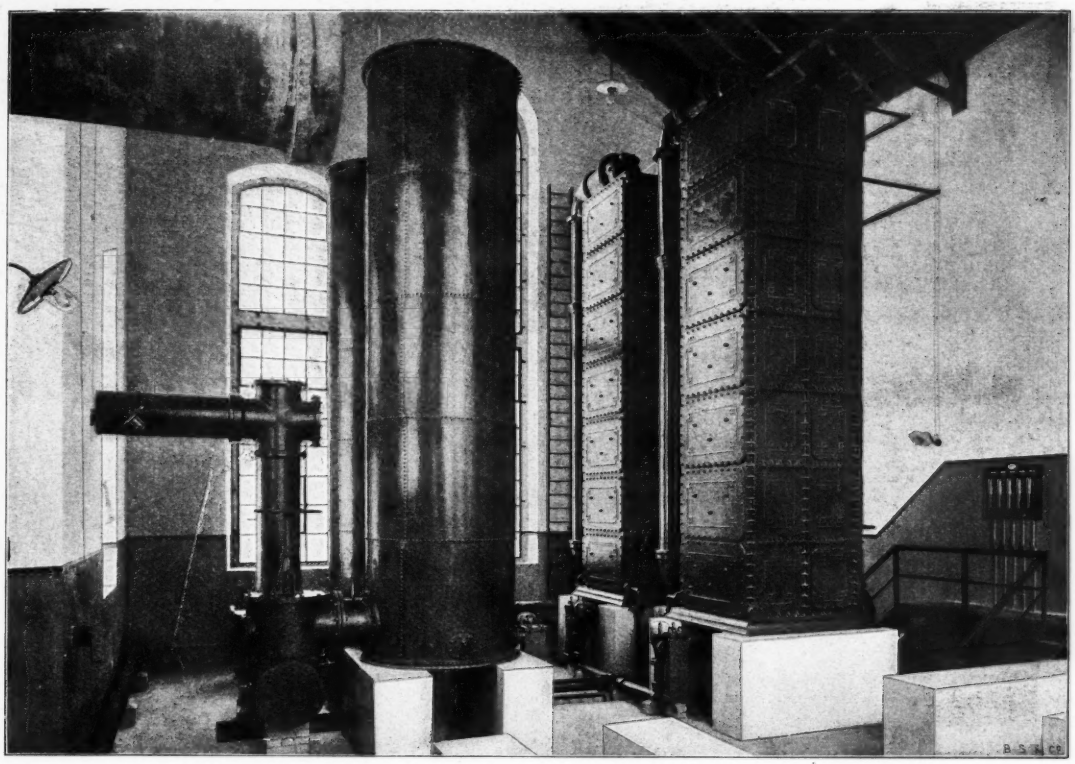


FIG. 15.—CONDENSER ROOM.

two main pipes. These pipes (shown in fig. 2 and on Plate I.) are of wrought iron, 5 mm. (0·197 inch) thick, joined with strong flanges, and are 450 mm. (about 17¾ inches) in diameter. They are above ground, and have a good slope, so as to facilitate the flow of the products of condensation. The distance between the two buildings is 25 metres (82 feet); and the two pipes are supported in the middle by a single trestle in iron. Each pipe has besides, at this point, an expansion joint, which allows of its dilatation under the influence of the temperature (which may vary up to 50°). These long pipes offer great advantages, especially in winter, when the make is very large; and they act also as a cooling medium, thus relieving the condensers. The condensers are, however, reckoned to be sufficient for all needs.

Machinery House (*Figs.* 12 *to* 18).

This building is divided into three distinct parts—condensers, exhausters, and washers. Each of these parts includes two separate sets of apparatus, of a capacity of 25,000 to 30,000 cubic metres (882,500 to 1,059,000 cubic feet) per day. The division of the rooms was rendered necessary, quite apart from the question of construction, by the different temperatures which would arise from the various parts. It was also necessary that future possible escapes of gas should not compromise all the apparatus. Very high subways have been made under the exhausters and washers (fig. 13), which allow of repairing the pipes and of controlling the flow of the tar and ammoniacal liquor. The making of a subway for the pipes of the condensers was not necessary; the mains and

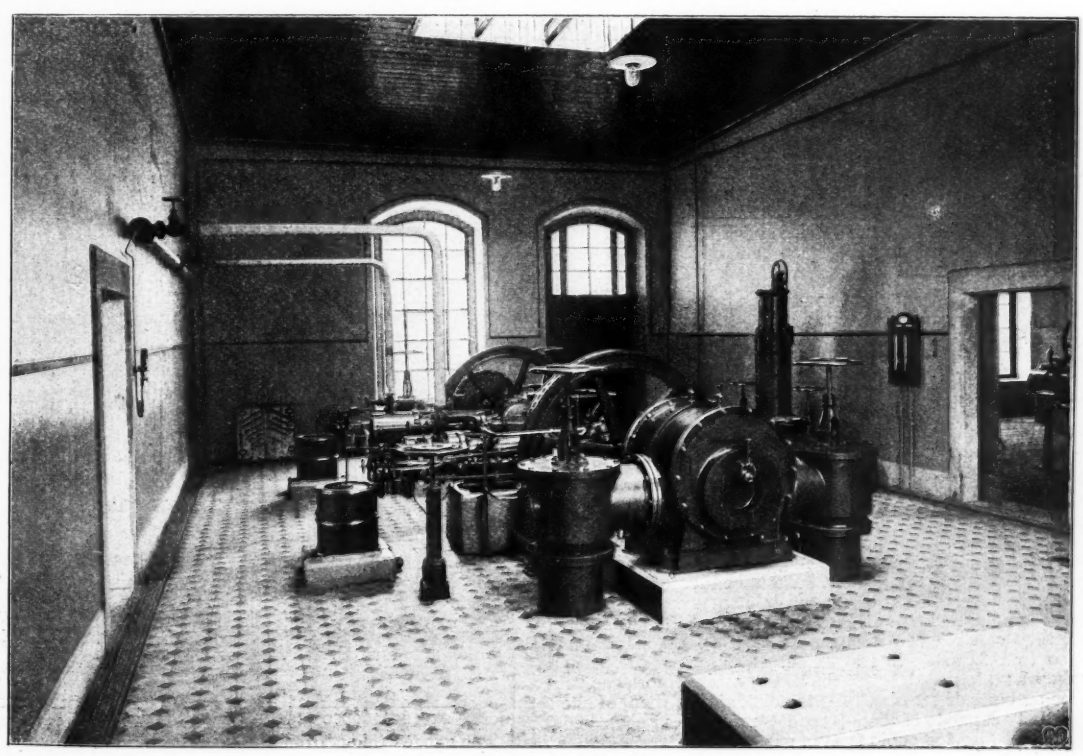


FIG. 16.—EXHAUSTER ROOM.

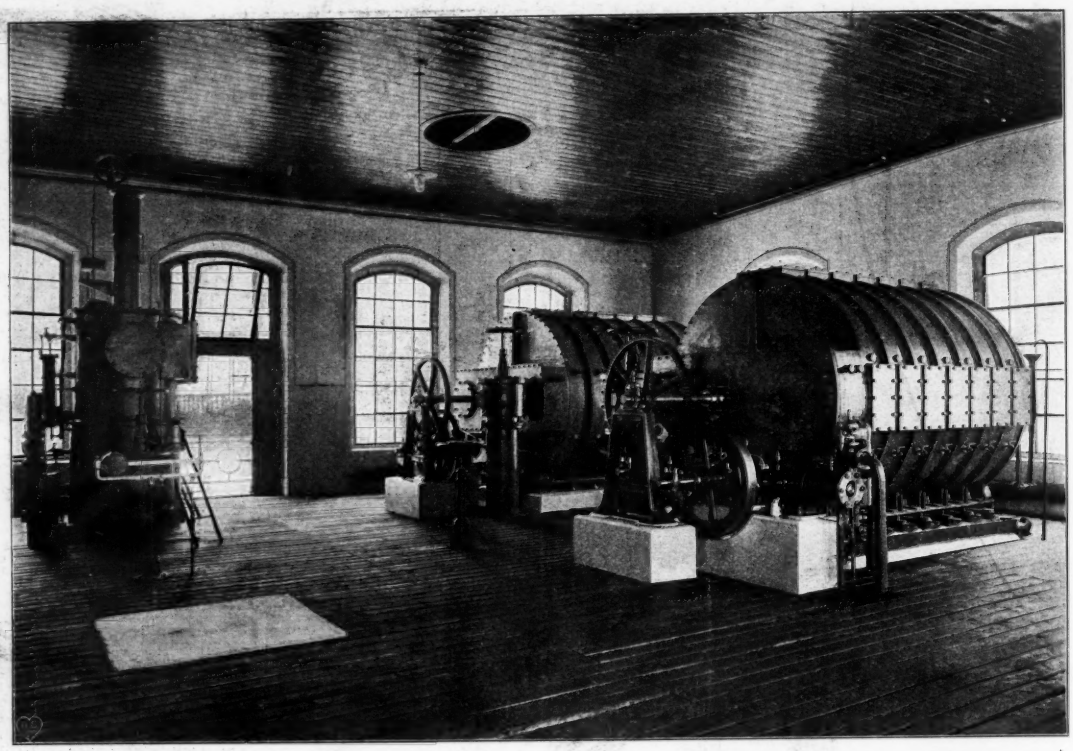


FIG. 18.—WASHER ROOM.

cleaning doors being on the ground, immediately alongside the plant, and of easy access. All the rooms are well lighted and ventilated, and accessible from the outside. The ventilation is obtained by a number of hinged windows; the condenser-room having, in addition, a venetian ventilating roof, and that of the washers, several ventilating shafts supplied with doors. A spiral staircase, finishing on a platform placed above the water-condensers, allows of their examination. The rooms of the machinery-house are lighted by incandescent electric lamps, the switchboard of which is, as a measure of precaution, placed outside the building. Electric safety lamps with contact-pins are used for lighting the inside of the apparatus and of the pipes, as well as for night repairs.

Condensers (*Figs. 13 to 15*).

The cooling of the foul gas, which arrives at the machinery-house at a temperature of from 50° to 60° C. (122° to 140° Fahr.), according to the season, ought not to be sudden, so as to avoid stoppages from tar, and other similar inconveniences. The effect of condensers is only complete when the gas does not circulate too quickly through them. For this reason, each set, of a capacity of 25,000 cubic metres (882,500 cubic feet), consists of two air-condensers and two water-condensers, on the Reutter system, through which the gas passes, one after the other. The two air-coolers (called annular condensers) are connected together, and are made up of two sheet-iron concentric cylinders. The gas passes through the annular space, and circulates alternately from top to bottom and from bottom to top, owing to separating partitions. The cooling surface of the inside and outside cylinder is about 52 square metres (560 square feet). Experience has proved that a surface of 2·5 square metres (27 square feet) is required for cooling 100 cubic metres (3530 cubic feet) of gas in 24 hours. Therefore a condenser with a surface of

$$\frac{52 \times 100}{2{\cdot}5} = 2080 \text{ or (net) } 2000 \text{ cubic metres}$$

(70,600 cubic feet) of gas in 24 hours. The two condensers will therefore deal with 2000 + 2000 = 4000 cubic metres (141,200 cubic feet) in 24 hours.

The two Reutter condensers are independent one of the other, and consist of a body made up of cast-iron plates. The inside is filled with horizontal pipes, through which the cooling water circulates from bottom to top; while the gas enters at the top of the apparatus, and after having passed round the water-pipes leaves at the lower part. The water-pipes are sprinkled on their outside with ammoniacal liquor by an arrangement (giving a continuous flow) placed on the condensers. Each condenser is made to treat a normal production of 11,000 cubic metres (388,300 cubic feet) of gas in 24 hours; but by increasing the amount of cooling water, they can reach a make of 12,000 to 13,000 cubic metres (423,600 to 458,900 cubic feet). These appliances have the advantage of taking up less space, and of cooling more gas with a smaller amount of surface. All the condensers, then, of one set have a daily capacity of 2000 + 2000 + 11,000 + 11,000 = 26,000 cubic metres (917,800 cubic feet) of gas.

This make of 25,000 cubic metres (882,500 cubic feet) of gas per 24 hours runs through the principal main of 450 mm. (about 17¾ inches) diameter, at a speed of—

$$\frac{25{,}000}{24 \times 60 \times 60 \times 0{\cdot}159} = 1{\cdot}82 \text{ m. (nearly 6 feet) per second.}$$

Before the inlet of the gas to the air-condensers, the two main pipes are connected together by another, also 450 mm. diameter, and supplied with a valve. This affords the great advantage of being able to pass the gas from one bench, as desired, into either of the sets. The tar-flow from each condenser and from the main pipe is enclosed in a glass bell, which renders it visible and easily accessible. A case placed before and after each condenser contains a thermometer and a pressure-gauge.

Exhausters (*Fig. 16*).

The gas is drawn from the retorts by a three-blade Beale exhauster for each of the two sets of apparatus. The exhausters, each of which is coupled direct to a steam-engine, can deal with 1500 cubic metres (52,950 cubic feet) per hour at 80 revolutions a minute. Electric motors were put on one side as a measure of safety, and to avoid danger of explosions. A double pipe leads steam from the boilers. One of them is ordinarily used for heating the building; but it also serves as a reserve pipe for the steam-engines. A third exhauster, placed between the other two, is used as a reserve, though it can, by means of valves, be utilized at will for either of the two mains. An automatic bye-pass governor for each exhauster prevents the suction of air, in case of too quick working of the exhauster, or avoids an increase of the pressure in the retorts, owing to too slow working or a sudden stoppage of the exhauster. If the pressure drops too much on the suction side, this governor puts it into communication with the delivery side, so that the pressure in the hydraulic mains and in the retorts can be kept constant at about 2 or 3 mm. (⅛ inch), which is necessary for good working.

The speed of the engines is regulated by a governor on the Hahn system, which governs itself according to the make of gas. This governor works, by means of gearing, directly on to the inlet-valve of the steam-engine. The gas-connection for the Hahn governor is made before the condensers; and the gas is brought to it by a special pipe, after having undergone partial purification. Each exhauster-shaft carries an eccentric, which works an air-pump. This drives into the gas a quantity of air up to 2 per cent., in order to facilitate the revivification of the material in the purifiers. The air is forced into a receiver, and arrives in the leading main after having passed a meter. This introduction of air is regulated by a special arrangement. As the greater part of the tar has already been separated by the condensers, each pipe starting from this point has a bore of only 400 mm. (15¾ inches), which, for an output of 25,000 cubic metres per 24 hours gives a speed of—

$$\frac{25{,}000}{24 \times 60 \times 60 \times 0{\cdot}125} = 2{\cdot}31 \text{ m. (7 ft. 7 in.) per second.}$$

The gauges taken from the suction and the delivery are placed together in a case in the exhauster-room.

Washers (*Figs.* 17 *and* 18).

After having passed the exhauster, the gas goes through a Drory condenser of a daily capacity of 25,000 to 30,000 cubic metres. This apparatus mechanically takes out the last traces of tar, and at the same time a considerable part of the ammonia contained in the gas. Ammoniacal liquor is required for the working of this apparatus. The varying flow of the ammoniacal liquor and tar is visible under glass bells. In case of too great pressure, an automatic bye-pass, set in the main pipe, allows the gas to go directly away. This bye-pass can also be controlled by a lever placed above the ground.

The gas, completely relieved of tar, then passes a "Standard" washer, which takes from it the last traces of ammonia. For some time past, this apparatus, acknowledged by all as excellent, has been used in the majority of the large gas-works of Germany, England, and France. The "Standard" washer consists of a cast-iron cylindrical body, in the centre of which is a shaft supported at its two ends by bearings. Paddle-wheels, separated from one another by partitions, are keyed on to this shaft. This receives a very slow revolving movement by means of gearing actuated by a small steam-engine; and the paddle-wheels, carrying small pieces of wood, are kept moistened by their passing through ammoniacal liquor, which fills half the cylinder. The gas enters by one end of the apparatus, passes through the paddle-wheels one after the other perpendicularly to the centre, and goes out at the opposite end. The saturating water runs through the apparatus in a contrary direction.

As the condensers and washers require periodical cleaning, a reserve apparatus is provided for each set. The sprinkling of these appliances is done with weak ammoniacal liquor, which is led to a tank by a special pipe connected before the condensers. This water is pumped into a raised reservoir, from which it flows to the plant. We shall return later to the ammoniacal liquor and tar tanks, as well as to the pumps connected with them.

TECHNICAL RECORD.

THEORY OF THE WATER-GAS PROCESS.

By Drs. H. Strache and R. Jahoda, of Vienna.

[Abstract Translation of Articles published in the "Journal fur Gasbeleuchtung" last year.]

I.—The Blow (*Continued*).

A large series of researches were made in the manner detailed last week, with the fuel-bed varying in depth from 2·70 to 0·87 metre (8·85 to 2·85 feet), and with the velocity of the air of the blast ranging from 1·67 to 4·08 metres (5·48 to 13·4 feet) per second; and the heat developed, the heat lost in the hot gas, the heat stored up, and the rise in temperature of the coke contained in the generator were determined in each case. In order to deduce the temperature which prevails in the generator, it is necessary to know also the temperature which obtains when the blow is commenced. The only means by which this initial temperature could be estimated was approximately from the temperature of the effluent gas in the first moments of the blow. The temperature of this gas proved to be less than the temperature in the body of the generator by a constant amount, which was on an average about 233° C. (451° Fahr.). The temperature of the effluent gases, which rises continuously, is indicated in the diagrams.

The calculations showed for each different thermic condition of the generator, both the percentage of carbonic acid in the gas and the efficiency; and finally the diagrams showed the efficiency for different amounts of heat stored up in the generator. It appeared, therefrom, that neither the proportion of carbonic acid in the effluent gas, nor the efficiency, was a function of the velocity of the air of the blast, nor of the depth of the bed of fuel; but that both were functions of the temperature of the generator, or of the heat stored up in it. The diagrams (figs. 1, 2, 3, 4, and 5*) are taken from a large number, and illustrate the effects of increasing velocity of the blast, and of different depths of the bed of fuel. The velocities are respectively: 1·67, 2·34, 2·88, 3·72, and 4·08 metres (or 5·48, 7·68, 9·45, 12·2, and 13·4 feet per second). In all these diagrams, the bottom curve (heat lost) shows the heat carried off by the gas per minute. The next curve (heat developed) indicates the heat developed in the generator per minute. The curve marked "Heat stored up" shows the heat stored up in the generator after a given interval of time. The other curves give the percentage of carbonic acid ("CO_2") and carbonic oxide ("CO") in the gas, the consumption of carbon ("C") for each minute, and the temperature of the generator ("Temp.") and of the effluent gas ("Temp. of effluent gases"). On the left of each diagram are the depth of the bed of fuel, the quantites of heat in calories, temperature (" °C "), quantities of carbon in pounds, and volumes per cent. of the gases; while the abscissæ axis is the length of the blow in minutes.

The efficiency and percentage of carbonic acid in the gas corresponding to different thermic conditions of the generators are shown also in the table below, in which v signifies the rate of flow of the air of the blast in the generator in metres and feet per second, and h the mean depth of the bed of coke.

In order to complete the explanation of the method of calculating results adopted in these researches, the following particulars are added: The percentage of carbonic oxide in the gas is calculated from the percentage of carbonic acid, thus: Complete combustion to carbonic acid gives a volume of that gas equal to the volume of oxygen in the air required for combustion; or the resulting gas consists of 21 per cent. of carbonic acid and 79 per cent. of nitrogen. Combustion wholly to carbonic oxide, gives a gas consisting of 34·7 per cent. of carbonic oxide and 65·3 per cent. of nitrogen. If the gas formed contains both carbonic acid and carbonic oxide, then there is nitrogen equal to $\frac{79}{21}$ times the volume ($= a$) of carbonic acid; or the air used up in the formation of carbonic acid would be equal to $\left(a + \frac{79}{21}\,a\right)$. The air used up in the formation of carbonic oxide would be equal to $100 - \left(1 + \frac{79}{21}\right)a$. As 1 volume of air in the formation of carbonic oxide, gives a gas containing 34·7 per cent. of that product, therefore the percentage thereof in producer gas containing a per cent. of carbonic acid would be

$$100 - \left(1 + \frac{79}{21}\right)a \times \frac{34{\cdot}7}{100}, \text{ which gives } 34{\cdot}7 - 1{\cdot}65\,a.$$

The carbon consumed is calculated from the quantity of air blown in and the percentages of carbonic acid and carbonic oxide in the producer gas, thus: Equal volumes of carbonic acid and carbonic oxide contain the same amount of carbon—*i.e.*, 0·536 kilo. per cubic metre; and consequently the amount of carbon in the producer gas can be computed from the total volume of these two gases by multiplying it (expressed in cubic metres) by 0·536. Thus, adopting the formula already given for finding the proportion of carbonic oxide, the carbon (in kilos.) is

$$(a + 34{\cdot}7 - 1{\cdot}65\,a) \times 0{\cdot}536.$$

* See p. 28 of last week's issue, and pp. 88 and 89.

Efficiency, per Cent.	$v =$	1·67	2·34	2·88	2·97	3·08	3·18	3·26	3·48	3·72	3·80	4·08*
		5·48	7·68	9·45	9·74	10·1	10·4	10·7	11·4	12·2	12·5	13·4†
	$h =$	ft. in. 7 2½	ft. in. 5 0½	ft. in. 4 7	ft. in. 4 5	ft. in. 4 1	ft. in. 4 3	ft. in. 2 7½	ft. in. 4 8	ft. in. 4 7	ft. in. 4 3½	ft. in. 5 7
		° C.	° C.	° C.	° C.	° C.	° C.	° C.	° C.	° C.	° C.	° C.
80		..	675	610	..	..	600	..	645	650	570	..
70		680	715	670	695	..	630	..	680	710	600	..
60		725	755	740	800	600	675	650	730	785	665	660
50		790	830	855	900	700	760	720	825	880	750	720
40		860	960	1010	980	825	930	825	1010	1100	890	830
30		1175	..	1500	1125	1120	1510	1150	1350	1450	1140	1450
20		..	..	..	1760	..	..	..	..	..	..	..
Percentage of Carbonic Acid.												
20		..	..	..	..	..	..	..	..	..	520	..
19		..	660	590	..	..	575	..	640	..	550	..
18		685	680	615	610	..	585	..	660	..	570	..
17		700	705	640	685	..	600	..	680	670	585	..
16		710	720	660	710	..	620	..	695	700	600	..
15		720	735	690	730	..	630	..	710	720	620	580
14		735	755	710	750	580	655	630	725	750	635	620
13		755	770	740	775	590	675	650	760	780	660	660
12		770	785	770	800	610	700	665	775	820	680	680
11		790	815	815	820	650	725	690	800	840	720	700
10		820	850	840	845	695	750	720	830	870	740	730
8		890	970	930	905	800	820	815	930	970	820	780
6		980	1050	1060	1000	880	1070	985	1145	1120	945	890
4		1320	..	1370	1565	1375	1340	..	1500	1310	1165	1840
3		..	..	..	..	..	..	..	..	1440	1300	..

* Metres per second. † Feet per second.

Depth of Fuel. Ft. Ins.	Calories.	Temp. Deg. C.	C lbs.	CO_2 %
9 2	140,000	1400		28
8 6½	130,000	1300		26
			5·5	
7 10½	120,000	1200		24
7 2½	110,000	1100		22
6 6¾	100,000	1000	4·4	20
5 11	90,000	900		18
5 3	80,000	800		16
			3·3	
4 7	70,000	700		14
3 11	60,000	600		12
3 3½	50,000	500	2·2	10
2 7½	40,000	400		8
1 11½	30,000	300		6
			1·1	
1 4	20,000	200		4
0 8	10,000	100		2

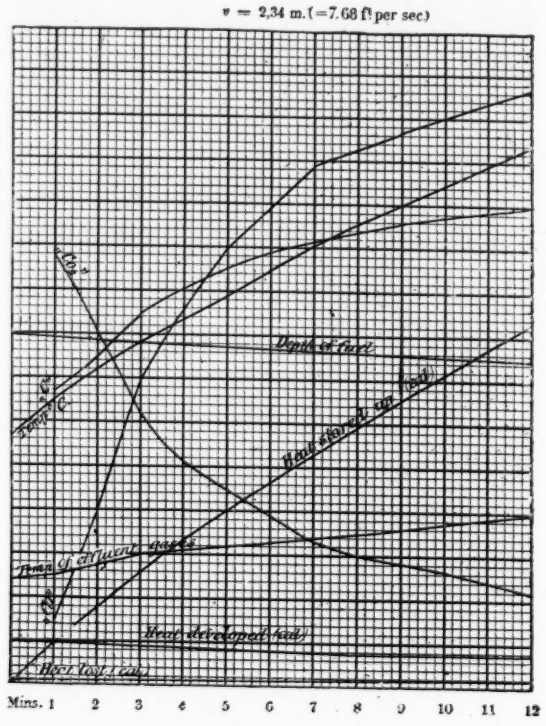


FIG. 2.

Depth of Fuel. Ft. Ins.	Calories.	Temp. Deg. C.	C lbs.	CO_2 %
9 10	150,000	1500	6·6	30
9 2	140,000	1400		28
8 6½	130,000	1300		26
			5·5	
7 10½	120,000	1200		24
7 2½	110,000	1100		22
6 6¾	100,000	1000	4·4	20
5 11	90,000	900		18
5 3	80,000	800		16
			3·3	
4 7	70,000	700		14
3 11	60,000	600		12
3 3½	50,000	500	2·2	10
2 7½	40,000	400		8
1 11½	30,000	300		6
			1·1	
1 4	20,000	200		4
0 8	10,000	100		2

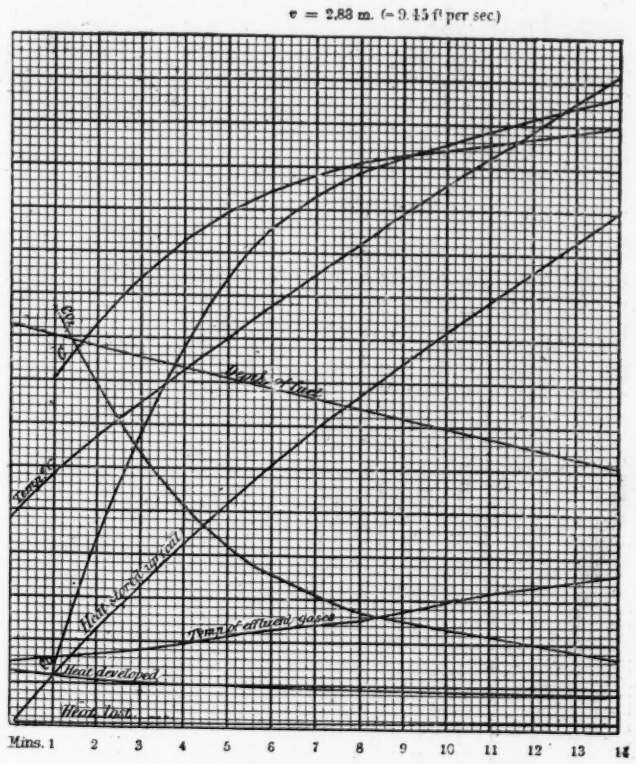


FIG. 3.

But as the quantity of the air blown in, and not that of the producer gas, is the known factor, the amount of gas formed from 1 volume of air must be calculated. a volumes of carbonic acid result from a volumes of oxygen $+ \frac{79}{21} a$ volumes of nitrogen. $34{\cdot}7 + 1{\cdot}65\,a$ volumes of carbonic oxide result from $\frac{34{\cdot}7 - 1{\cdot}65\,a}{2}$ volumes of oxygen $+ \frac{79}{21} \times \frac{34{\cdot}7 - 1{\cdot}65\,a}{2}$ volumes of nitrogen. Therefore, 100 volumes of producer gas result from the sum of the above quantities of oxygen and nitrogen—viz., from $0{\cdot}83\,a + 82{\cdot}6$ volumes of air. Consequently, A volumes of air give $\frac{100}{0{\cdot}83\,a + 82{\cdot}6}$ A volumes of producer gas. On multiplying this with the proportion of carbon in the producer gas, as found above, the carbon (in kilos.) burnt by A volumes (in litres) of air is as follows.

$$\frac{100\,(a + 34{\cdot}7 - 1{\cdot}65\,a)\;0{\cdot}536}{100\,(0{\cdot}83\,a + 82{\cdot}6)}\text{ A},$$

which gives $\frac{18{\cdot}6 - 0{\cdot}348\,a}{0{\cdot}83\,a + 82{\cdot}6}$ A.

The heat developed per minute is calculated thus: a cubic metres of carbonic acid weigh $(a \times 1{\cdot}977)$ kilos., and therefore result from $\frac{12\,(a \times 1{\cdot}977)}{44}$ kilos. of carbon, yielding $\frac{12\,(a \times 1{\cdot}977) \times 8080}{44}$ calories.

$(34{\cdot}7 - 1{\cdot}65\,a)$ cubic metres of carbonic oxide weigh $(34{\cdot}7 - 1{\cdot}65\,a) \times 1{\cdot}251$ kilos., and therefore result from

$$\frac{12\,(34{\cdot}7 - 1{\cdot}65\,a) \times 1{\cdot}251}{28}\text{ kilos. of carbon,}$$

yielding $\frac{12\,(34{\cdot}7 - 1{\cdot}65\,a) \times 1{\cdot}251 \times 2473}{28}$ calories.

100 cubic metres of the producer gas, containing a per cent. of carbonic acid, therefore, are produced with the development of

$$\frac{12\,(a \times 1{\cdot}977) \times 8080}{44} + \frac{12\,(34{\cdot}7 - 1{\cdot}65\,a) \times 1{\cdot}251 \times 2473}{28}$$

calories, which gives

$$46000 + 2176\,a\text{ calories.}$$

With A volumes of air, the heat developed therefore amounts to

$$\frac{46000 - 2176\,a}{0{\cdot}83\,a + 82{\cdot}6}\text{ A calories.}$$

The heat carried off by the producer gas, or heat lost, is calculated thus—

The producer gas consists [see above] of

a		
		per cent. of carbonic acid
$(34{\cdot}7 - 1{\cdot}65\,a)$		„ „ „ carbonic oxide
and $100 - (a + 34{\cdot}7 - 1{\cdot}65\,a) =$		
$(0{\cdot}65\,a + 65{\cdot}3)$		„ „ „ nitrogen.

Depth of Fuel. Ft.	Ins.	Calories.	Temp. Deg. C.	C lbs.	CO_2 %
11	9¾	180,000	1800	7·7	36
11	2	170,000	1700		34
10	6	160,000	1600		32
9	10	150,000	1500	6·6	30
9	2	140,000	1400		28
8	6¼	130,000	1300		26
7	10½	120,000	1200	5·5	24
7	2¾	110,000	1100		22
6	6¾	100,000	1000	4·4	20
5	11	90,000	900		18
5	3	80,000	800		16
4	7	70,000	700	3·3	14
3	11	60,000	600		12
3	3½	50,000	500	2·2	10
2	7½	40,000	400		8
1	11½	30,000	300		6
1	4	20,000	200	1·1	4
0	8	10,000	100		2

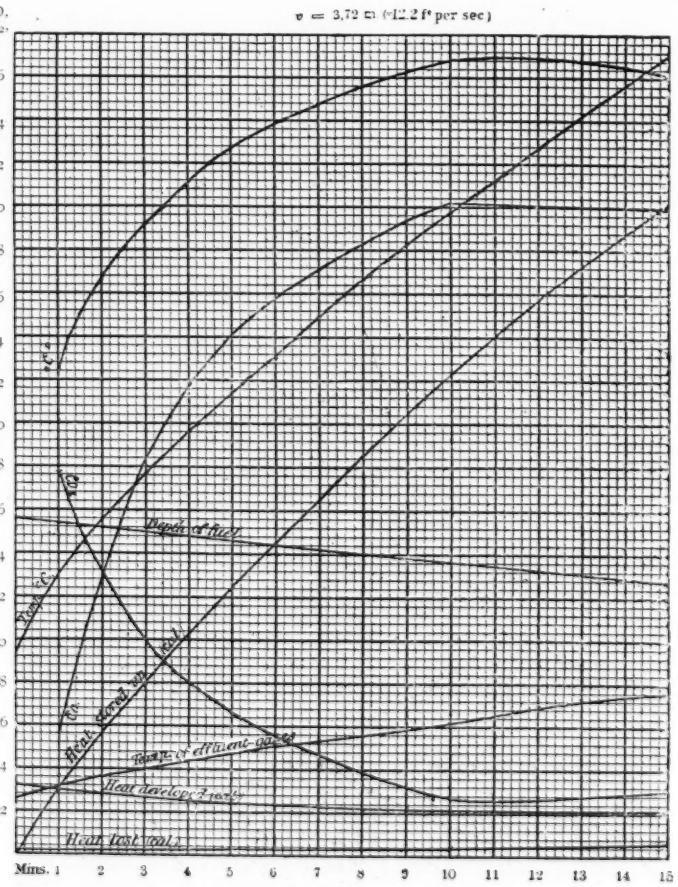

v = 3.72 m. (=12.2 ft per sec.)
Temp.
CO
Depth of fuel
Heat carried up coal
Heat carried off in effluent gases
Heat developed by coal
Heat lost (rad.)
Mins. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

FIG. 4.

Depth of Fuel. Ft.	Ins.	Calories.	Temp. Deg. C.	C lbs.	CO_2 %
12	5½	190,000	1900		38
11	9¾	180,000	1800	7·7	36
11	2	170,000	1700		34
10	6	160,000	1600		32
9	10	150,000	1500	6·6	30
9	2	140,000	1400		28
8	6¼	130,000	1300		26
7	10½	120,000	1200	5·5	24
7	2½	110,000	1100		22
6	6¾	100,000	1000	4·4	20
5	11	90,000	900		18
5	3	80,000	800		16
4	7	70,000	700	3·3	14
3	11	60,000	600		12
3	3½	50,000	500	2·2	10
2	7½	40,000	400		8
1	11½	30,000	300	1·1	6
1	4	20,000	200		4
0	8	10,000	100		2

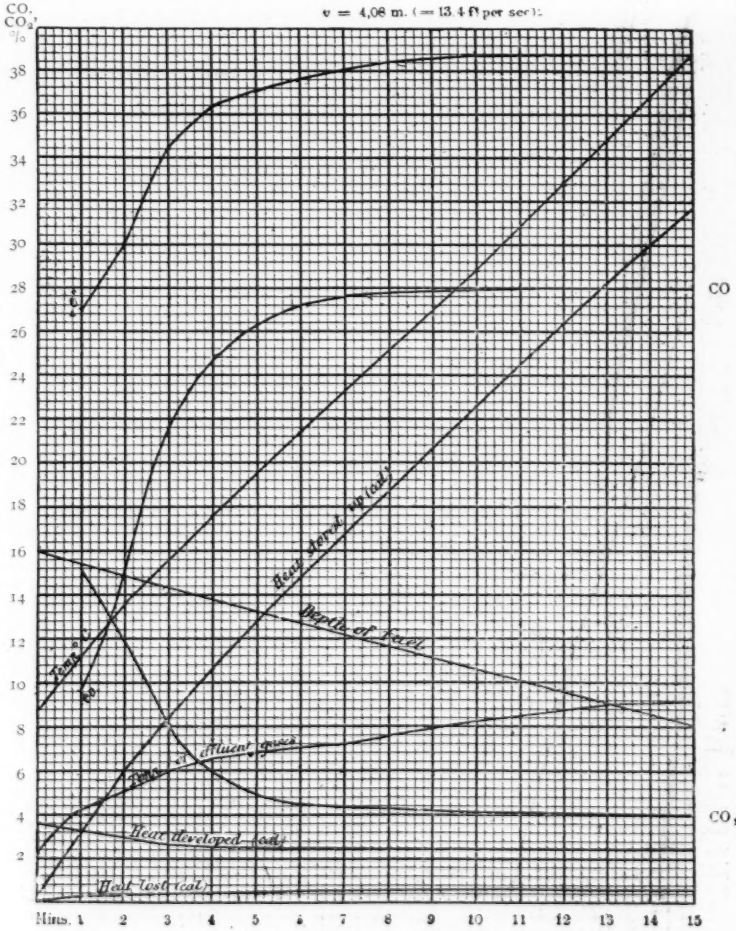

v = 4.08 m. (= 13.4 ft per sec.)
CO
CO_2
Heat carried up coal
Depth of fuel
Effluent gases
Heat developed by coal
Heat lost (rad.)
Mins. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

FIG. 5.

The heat carried off at temperature t is therefore—

By the carbonic acid:

$$\frac{100\ A}{0{\cdot}83a + 82{\cdot}6} \times \frac{a}{100} \times \left(0{\cdot}20 + \frac{t}{5660}\right) \times 1{\cdot}977\ t.$$

By the carbonic oxide:

$$\frac{100\ A}{0{\cdot}83\ a + 82{\cdot}6} \times \frac{34{\cdot}7 - 1{\cdot}65\ a}{100} \times 0{\cdot}245 \times 1{\cdot}252\ t.$$

By the nitrogen:

$$\frac{100\ A}{0{\cdot}83\ a + 82{\cdot}6} \times \frac{0{\cdot}65\ a + 65{\cdot}3}{100} \times 0{\cdot}244 \times 1{\cdot}257\ t.$$

Making a total of

$$A\ t \times \frac{a\ (0{\cdot}086 - 0{\cdot}000347\ T) + 30{\cdot}69}{0{\cdot}83\ a + 82{\cdot}6} \text{ calories.}$$

(To be continued.)

Gas-Engines Used in the Manufacture of Carbide of Calcium.—The United Alkali Company have just started a new industry at their Sullivan Works, Widnes, in the manufacture of carbide of calcium; the motive power being taken from gas-engines. The department is under the management of Mr. Joseph Bastick, the Electrical Engineer of the works.

LEGAL INTELLIGENCE.

Collieries Fined for Failure to Deliver.

In the Court of Session recently, Lord Kyllachy gave judgment in an action by the Northern Co-operative Company, Limited, of Aberdeen, against the Londonderry Collieries, Limited, of Seaham Harbour, in which the pursuers sued for £529. They stated that in June, 1892, the Marquis of Londonderry, the predecessor of the defenders, sold to them 15,000 tons of Vane's Wallsend coal at the price of 13s. 3d. per ton of 20 cwt., with a discount of 2½ per cent. if paid within 15 days; deliveries to be as nearly as possible in equal monthly quantities during the twelve months. The pursuers did not receive the deliveries at the rate of 1250 tons per month, and they sued for the loss said to have been incurred by them in consequence. The defenders said the pursuers received in the months from October to May as much coal as they provided vessels to take; that during the whole period the output of coal was restricted by the miners; and that, in terms of the contract with the pursuers, the defenders were not bound to deliver more than they did. Lord Kyllachy held that the defenders were in default with several shipments, and that the total shortage was exactly 2000 tons. The result would be that the pursuers would have a decree—not for the sum for which they sued, but for a substantial amount, which the parties would be able to calculate.

Workmen Shareholders and the Compensation Act.

At the Todmorden County Court recently, Judge Cadman gave his award in the case in which Mrs. Isabella Shaw, widow, of Hebden Bridge, claimed £300 from Messrs. F. & H. Shaw, Limited, an engineering firm in the town, for the loss of her husband, who was killed in a crane accident at their works in June last. The only questions to be decided were: (1) Was the deceased a workman for the Company as defined by the Workmen's Compensation Act; if so (2), did his being a shareholder and a Director prevent his widow recovering compensation for the accident which caused his death. His Honour said that if the contention of the respondents held good—namely, that a shareholder could not recover—its effect would render valueless and inoperative the statute in case of co-operative manufacturing companies, collieries, or businesses where workmen are shareholders. The award provided that £200 should be paid to the widow, and a further sum of £100 invested by the Registrar of the Court for the benefit of three of the deceased's children.

Claims in Respect of Substituted Gas-Meters.

At the Todmorden Petty Sessions last Thursday, before Messrs. D. J. Crossley (Chairman), S. Fielden, T. E. Sutcliffe, and C. Hoyle, Mr. William Eastwood, a wholesale clothier, of Hebden Bridge, was summoned by the Hebden Bridge and Mytholmroyd Gas Board for £1 6s. 6d., the price of a gas-meter supplied to him, less 5s. allowed for the old meter taken out. Mr. Craven appeared for the Gas Board; Mr. Parker represented Mr. Eastwood. Mr. Craven said that about three years ago a new meter was put into defendant's house, for which £1 11s. 6d. was charged; but 5s. was credited for the old meter taken out. It appeared that it was necessary to increase the storage and pressure of gas at the works. After this had been done, Mr. Eastwood's meter was found to frequently require watering. The servants of the Board paid several visits, and did what they could to make the meter work properly, but could not succeed; and eventually it was taken out, and a dry one put in. The claim was for the price of this meter, less 5s. allowed for the old one. Mr. R. West, the Board's Manager, stated that in the course of an interview he had with Mr. Eastwood, that gentleman said if the old meter would not do they must put in another, and they did so. It was dated 1884, was practically worn out, and would not stand the increased pressure. There were similar cases in the same district. Mr. Parker submitted that the meter taken out was a legal one, and had not been shown to be at fault, as this lay with the pressure. It was for the Board to show that the meter had been tested as required by the Act of Parliament, and been found defective. Mr. Hoyle asked if it was contended that the Board had exceeded their right in putting the extra pressure on. If not, and defendant's meter would not stand the pressure, it appeared to him that he would have to get one that would. Mr. Parker said he did not contend that the Board had exceeded their right, but that they would have to prove a contract to purchase before they could recover. Mr. Eastwood was then called, and denied that he had given instructions for a new meter to be fixed. He thought the old one had been taken out to be repaired, and would be put in again. It was his own property, and had only been in use ten or eleven years. The Chairman said the Bench considered the Board must have judgment in their favour; Mr. Eastwood would therefore have to pay the sum demanded, and costs. Mr. J. Clay, a chemical manufacturer, of the same locality, was summoned on a similar charge; the amount in this case being for £1 1s. Evidence having been given by Mr. West, Mr. Parker submitted that there was nothing to show that Mr. Clay had asked for a new meter. Mr. Clay was called and spoke of the difficulty they had had with the gas supply after the pressure was increased, but said he never asked that his own meter should be taken out, and a new one put in. There had been a number of these cases, and some of the parties had paid under protest. The Bench gave judgment for the plaintiffs for the amount claimed, and costs.

A trade and domestic exhibition is being held at Chester; among the exhibitors being Messrs. John Wright and Co., of Birmingham. The Gas Company also make an effective display with incandescent gas-lights and new patterns of fittings.

Birmingham is just now suffering from a dearth of pennies, owing doubtless to so many being locked up in prepayment gas-meters and penny-in-the-slot-machines. It is estimated that about £3000 worth of these coins are thus kept from circulation in the town.

MISCELLANEOUS NEWS.

FLOODS IN THE MIDLANDS AND WEST OF ENGLAND.

Leicester Gas-Works Inundated.

Brief as was the account which we gave last week of the flood at the Leicester Corporation Gas and Electricity Works, and the consequent partial interruption of working, it was sufficient to show the seriousness of the occurrence. Subsequent news informed us that the heavy rains and gales of Sunday and the preceding days had produced widespread destruction and trouble in the Midlands, and that several gas-works had been involved, in greater or less measure, in the general havoc. But the Leicester works were the biggest sufferers; and to Leicester we will first turn attention.

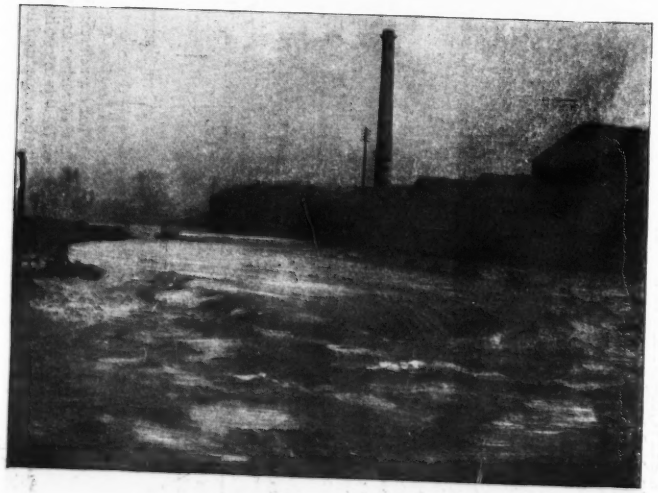
It appears that the floods throughout the Soar Valley were very extensive—more so than have been known for many years past. The brook at Aylestone (which is a low-lying part of Leicester) became—incapable as it looks at ordinary times—a raging torrent, flooding a number of streets; and, crossing the Aylestone Road, the waters entered the gas-works, extinguishing the fires in the retort-houses in spite of all the men could do to prevent it. The electric lighting works fared no better. The water entered the building, and flooded the boiler-flues; the consequence being that the greater number of shops were without electric light during part of Monday, but fortunately the gas supply was maintained. Happily, too, the 2 million cubic feet water-gas installation (which is scarcely complete) escaped from injury. But never before since the establishment of the Aylestone Road Works have they passed through such an experience as that of the early part of last week; and never before has an emergency arisen in connection with the gas and electric light undertakings in which the inhabitants of Leicester have had cause to be thankful in the superlative degree that they had at the head of the works a man of such resource and energy as Mr. Alfred Colson, and under him a loyal staff and band of employees. Had this not been so, Leicester might last week have undergone the dire ordeal of being without the means of artificial illumination, excepting such as the small Belgrave Road Gas-Works and oil-shops could have afforded. The threatened disaster, however, was so admirably dealt with that the town suffered comparatively slight inconvenience.

Through the kindness of Mr. Colson's younger son Cecil and Mr. N. K. Thomson, one of the members of Mr. Colson's staff, we to-day are able to give photographic views which will convey an idea of the character and gravity of the flood surrounding the works. Undue criticism must not be passed on these views; they were taken hurriedly, and the density is due to the fact that daylight was failing at the time they were secured. One of the pictures portrays the condition of the Aylestone Road; the second the entrance gates and avenue through the works, after the flood had partially subsided; the third view was taken from the electric-lighting station, and shows a considerable section of the works under water; and the fourth depicts the scene near the wharves.

For the larger part of the following graphic account of the catastrophe, we are indebted to the "Leicester Daily Post," and for some of the interpolated information to Mr. Colson: The danger of inundation at the gas-works would naturally be supposed to arise from the proximity of the River Soar and the canal, which pass between the works and St. Mary's Mills; and to avert any possible risk from this source, a large bye-wash was purposely constructed to relieve the pressure of water in the upper reach of the river carrying it away over a weir down to the lower level. Up to the present, this bye-wash has performed its special function very satisfactorily—indeed, in the present instance it undoubtedly saved the works from partial destruction. But, curiously enough, the flooding which brought about the serious condition of affairs at the gas-works on Monday emanated from an entirely different and totally unexpected quarter—namely, the Aylestone Road. To have suggested a few days ago the possibility of the Saffron Brook so flooding Aylestone Road as to send a half-yard-deep torrent tearing madly through the main entrance of the gas-works would certainly have been regarded as a mere flight of imagination. And yet, in sober fact, that is what occurred during Sunday night and the early hours of Monday. The Saffron Brook crosses Aylestone Road a short distance beyond the gas-works entrance; and it was here that the first signs were observed of the inadequacy of the brook course to carry off the immense volume of water which the continually descending torrents of rain eventually produced. Before midnight on Sunday, the water began to encroach on the roadway; and by one o'clock it had reached the gates of the gas-works entrance, where the slight decline in the main roadway through the works carried it straight to the retort-houses. Measures were at once taken to prevent the stream of water getting into the houses, the fires in which are some 5 or 6 feet lower than the ground surface. So rapidly did the water rise, however, that it soon got beyond control, washing away the barriers of sand-bags and clay which were used to stay its progress; and by two o'clock a steady stream of water was pouring into No. 1 retort-house, which ordinarily produces nearly 3 million cubic feet of gas per day. In the meantime, Mr. Colson, who had been at the works during a great part of Sunday, had been telephoned for; and he arrived about half-past two. He was only able to effect an entrance by wading through the lake which had formed in Aylestone Road, and the turbid stream passing through the gates.

The scene within the works at this time was truly awful, and one that must have struck any but cool-headed men with consternation and dismay. The rain was falling in a perfect deluge amid a hurricane of wind, and a broad stream of water, 1 ft. 6 in. deep, was rushing over the railroad track through the centre of the works, until it reached a depression on the left, where, fortunately, instead of continuing in the direction of the electric lighting works, it swept in a wide curve back into the Saffron Brook, which passes under a portion of the works. The two great retort-houses were a centre of some excitement, as well as danger. They were partially enveloped in dense clouds of steam which was generated when the still rising water reached the fire holes under the retorts. The men, wading about in front of the furnaces, had stuck

A View of Aylestone Road, Leicester.



View from the Electric Light Station.

grimly to their weird task of feeding the fires while the murky stream slowly but surely rose around them. At length, as the hissing waters quenched fire after fire, Mr. Colson, recognizing the futility of attempting to keep the retorts going, ordered the men to retire from the first section; and it was not long before the encroaching water had effectively extinguished the fires. There was danger, too, in working under conditions such as these, owing to the possibility of explosions of pent-up gases, or imprisoned air. Happily, nothing of the kind did occur; but when the conditions were so altogether abnormal as in this case, it was essential that every precaution against accident and possible disaster should be taken.

Under Mr. Colson's direction, the energies of the men were now chiefly devoted to preventing the inundation of No. 2 retort-house, the plant in which is responsible for the production of 4 million feet of gas a day. Despite, however, the most strenuous efforts, it was only found possible to keep half the retorts going in this section; so that the producing power of the works was reduced in a few hours from 7 million cubic feet to 2 millions. Half of the section was completely put out of action owing to the foul main to the condensers becoming flooded through the self-acting seal in the tar and liquor wells.

The inroads of the flood were by no means confined to the retort-houses, for the engine-house suffered in like manner, and, last of all, but of equally serious import, the water forced its way into the basement of the electric lighting works, and gradually filled it to a depth of at least 5 feet, submerging the under portion of some of the plant, including parts of the switching apparatus. Mr. Colson kept the engines and dynamos going until seven o'clock on Monday morning, when he felt compelled, for the safety of the plant, to suspend operations; and as a result the day supply of electricity to the town was entirely cut off. Meantime, everything that engineering skill could devise was being done to minimize the serious effects of the floods, so far as the production of gas was concerned. Orders were telephoned to the Belgrave Road works to put all the retorts there into immediate use, and so increase the production from 2 to 3 million cubic feet in the day. Efforts at Aylestone Road were concentrated upon restoring the full use of No. 2 retort-house as No. 1 was hopelessly put out of action, and was not in a condition to be used again for a day or two.

The Engineer sought the co-operation of the Borough Surveyor, at an early hour on Monday; and thanks to the good offices of Mr. Mawbey and his staff, the main sewers were made use of to carry away a good deal of the water from Aylestone Road. An embankment, composed of bags of sand and clay, was constructed across the entrance to the gas-works, and ultimately, by this means, the newly-formed river was entirely stopped.

A journalist who visited the works on Monday writes: The interior of the works everywhere bore traces of the night's exciting experience. The single-line railway cutting to the right was converted into a narrow canal, the coal-trucks standing partially submerged. The roadway was silted up with sand and dirt, not unlike the bed of a river; but it was not until No. 1 retort-house was reached that the serious character of the visitation was realized. As already intimated, the retort fires are below ground, and here was a very different scene from that which usually meets the eye. The lower level was under 5 feet of water, somewhere below the surface of which were the stoke-holes. The upper parts of the retorts, still hot, emitted jets of steam fitfully; but otherwise the whole place was silent and gloomy. It was impossible, Mr. Colson courteously explained, to get No. 1 retort-house into working order for a time; and he expressed the hope that consumers of gas in the town would

The Entrance Gate and Avenue through Works.

The Scene around the Wharves.

be patient while the works were labouring under present difficulties. At No. 2 retort-house matters were assuming a more promising aspect; and it was confidently hoped that before the evening the whole of its producing power would again be utilized. Passing on to the electric lighting station, the visitor might have supposed that fire and not water had been the cause of all the trouble; for here the two steamers from the Central Fire Station were found energetically at work, pumping out the water from the basement. Although it was a long time before the pumping operations seemed to materially affect the quantity of water in the basement, a gradual subsidence began to be noticed towards one o'clock. The water had entered from the lower floor of the adjoining building, now in course of erection, and beneath which the Saffron Brook is carried by means of a culvert. It was only by blocking up the apertures between the two buildings with bags of clay that the inrush of water was eventually stayed, and when this was done the powerful fire-engines soon gained the mastery. So far as could then be ascertained, Mr. Colson was of opinion that the actual damage done to the works would be comparatively slight, outside the suspension of work. All the foundations of the buildings have been substantially laid; and the portions of the plant now submerged are not likely to be materially injured by the water. Of course, a considerable amount of time will be occupied in cleaning the parts affected; but beyond this, it is hoped that no serious damage has been done. Unfortunately, the whole of the chemical works were more or less affected, and operations had to be entirely suspended in this section during the day.

The Mayor (Alderman Lennard), who is Chairman of the Gas and Electric Lighting Committee, visited the works during the same morning, and inspected the work then in progress for enabling operations to be resumed. Mr. Colson paid a generous tribute to the staff and workmen for the energy and determination they had displayed throughout what was a very trying period, mentioning as an evidence of the men's loyalty the fact that the employees on the night shift volunteered, unasked, to continue at work as long as they could be of service. The offer was at once accepted; and thanks to the excellent organization for which these works have long been famed, an emergency that must otherwise have proved almost disastrous for the town was coped with in a manner that proved entirely successful.

The arrangements with regard to the electric light resulted in the current being switched on at dusk, but unfortunately for the shopkeepers on two circuits who depended upon it, the light failed a short time afterwards, and for a while various temporary expedients had to be resorted to. Ultimately the current was fully restored.

Destructive Effect of the Flood at the Saltley Gas-Works, Birmingham.

The unusual heavy flow in the River Rea and the Birmingham and Warwick Junction Canal was responsible for the flooding of a portion of the Birmingham Corporation Gas-Works at Saltley. Through the grounds occupied by the works, and near what is known as the Nechells new works, runs the Rea, usually a miserable stream about a foot deep. It has recently been newly banked in by thick brickwork, and a portion of it has been bridged over as a matter of convenience in carrying on the operations of the works. It will be recollected by members of the Midland Association that this work was in progress on the occasion of their last visit to Saltley. Early on Sunday evening, the water began to rise, and continued to do so until it had risen a distance of about 15 feet. Still it rose, and the water flowed in copious volumes all over this portion of the works, which is the lowest part of a large area covered by the works. It flowed in a torrent into the canal basin, filling it to overflowing; ran on towards the buildings where the workmen were engaged in their night duties; filled up the pit along which the coke-conveyor runs, rendering it useless; filled up the remaining space in the huge tar-tank, the top of which is level with the ground, and then flowed in a torrent into the house where water gas was being manfactured. Disaster was here averted by the workmen raking out all the fires, and shutting off steam before the water reached too high a level. Later on, the canal at Park Mills, about three-quarters of a mile from the works, burst its banks; and this had a ruinous effect upon the canal basin at the gas-works. It had withstood the tremendous weight of the additional water from the too generous river; but the water was evidently loosening the granite setts at the sides. Then came the burst lower down; and the water rushed from the basin, and the space was soon emptied. Being deprived of the support given by the added volume of water, the banks of the basin collapsed; and a considerable portion of them was washed away in the headlong rush of the water. Lower down, the river again overflowed its boundaries, and a heavy wall dividing the grounds of the works from the towing-path of the canal was not strong enough to bear the weight; and from 120 to 150 yards of it was washed down. No other serious damage was done; and the manufacture of coal gas was not interfered with. Only the manufacture of water gas was interrupted. The assistance of the fire brigade was early requisitioned; and it was expected that operation of the water-gas plant would be recommenced early on Tuesday. Several of the engine-houses upon the grounds were partly flooded; and a portion of the supports of the Midland Railway bridge to the siding in the works were damaged. In the meantime, coal and other commodities are being delivered *viâ* the London and North-Western line. The largest gasholder on the works, and the second largest in the kingdom, was full to its extremest limit; and Mr. Henry Hack, who was responsible for its erection, is proud that it has stood so severe a test without the slightest damage. The Contractors (Messrs. C. & W. Walker) are also to be complimented. At a meeting of the Gas Committee on Monday, Mr. Hack reported that the damage done to the works was estimated at between £2000 and £3000.

Damage and Interruption of Supply in other Towns.

The inundations and damage in Coventry and the neighbourhood were extensive. The gas-works were flooded, the fires were extinguished in one portion of the retort-houses, and a section of the mains was waterlogged. The Radford brook runs underneath the works; and the rush of water was so great that one of the arches in the retort-houses was forced up. The water immediately surged up the inspection hole in the floor, covered the house, extinguished the whole of the fires on one side, swamped the settings, and filled the cellars underneath. The fires in the new retorts were not extinguished; but the water was so deep here that it was impossible for the men to get near the fires to attend to them. The result was that the gas-making operations were practically at a standstill. Mr. George Winstanley and his men put forth strenuous efforts to cope with the difficulty. A most anxious time was spent during the early hours of Monday. But fortunately the rush of water subsided; and the work of the Manager and his assistants was so successful that no portion of the city was without a supply of gas. Water found its way into the mains, however, and this partly affected the service in one or two localities. Unfortunately, just as the retort-house was cleared and the fires had been re-started, an accident occurred to the plant. One of the mains in connection with the pumps burst; and this caused a shortage in the supply during Wednesday. Had this accident not taken place, the supply would not have been curtailed; but happening immediately after the stoppage of operations through the flooding, it was impossible to keep the city wholly supplied. To the relief of all concerned, gas-making was fully resumed on Wednesday afternoon. During the time of trial, Mr. Winstanley left nothing undone to provide the city with gas; and he must be congratulated in so successfully coping with the difficulties. The Fire Brigade steamers in this case too proved most useful in removing the water from the base of the works. The emyloyees cleared one cellar themselves; and a steamer lifting 400 gallons of water a minute was at work for many hours.

Bath did not escape the visitation; but the gas supply was not affected—no difficulty being experienced in making and distributing gas during the whole period of the flood. A considerable further rise would have had to occur before it would have jeopardized the supply. For this no doubt thanks are due to the efficient defensive arrangements made against the flooding of the works after the painful and harassing experiences of 1894. But the electric lighting fared worse. Confident assertions as to the safety of the station (which the Corporation have not found a particularly good egg, but which, being now a municipal affair, the local press try to make the best of in a fanciful way) were put forth in one paper. But by seven o'clock Monday evening, the electric lights were extinct in all streets; and this created some amusement outside the circle of municipal supporters. The press tried to minimize the affair as much as possible; but the inhabitants were bereft of the electric and not the gas light, and that was sufficient for them.

Considerable inconvenience and loss were occasioned in Frome on New Year's Day by the announcement by the Gas Company that the supply of gas would be cut off from one o'clock until six o'clock the next morning. The fires at the gas-works had been extinguished by the flood on the previous day. As a consequence of the suspension of the supply, those manufactories in which gas-engines are employed were closed at the dinner hour; the remaining workshops being shut up shortly after four o'clock. Various modes of lighting were adopted—candles predominating. The "parish lantern" made up the deficiency in the street lighting.

Among other works at which damage of a minor character occurred, but considerable inconvenience was caused, may be mentioned Warwick, where the inhabitants were temporarily deprived of gas by the flooding of the retort-house and the stoppage of the inlet and outlet pipes of the holders; Stratford-on-Avon, where manufacturing operations were suspended for a time, the buildings on the works being flooded to the depth of 5 or 6 feet; Alcester, where the streets were thrown into perfect darkness; Burnham, where the gas plant and buildings suffered injury; and Stroud, where a large quantity of coke was washed from the works. An interruption of the supply of electric current occurred at Burton-on-Trent. Injury was also sustained by the Coalbournbrook station of the Stourbridge Water-Works. Railway traffic was affected in places; and large quantities of coal are waiting removal.

A Gas Worker's Presence of Mind.

Recognition may be made here of an incident in connection with these disastrous floods in which a gas worker showed admirable presence of mind. The floods caused a settlement of the centre arch of an important bridge on the Midland Railway near Leicester; and the first to notice there was a depression in the rails was William Law, who has charge of the coal-weighing machines at the Aylestone Road Gas-Works. Without hesitation, he gave information which led to the immediate blocking of the line to Leicester. But for his prompt action, a serious catastrophe might have ensued. In recognition of Law's services, Mr. Colson on Thursday received a letter from the Chief Engineer to the Midland Railway Company, enclosing a present, which he desired should be handed to Law. Mr. Colson has also been requested by the Mayor (the Chairman of the Gas Committee) to reward Law for his conduct in the matter.

Scraping a Water-Main.—At the last meeting of the Cockermouth and Workington Joint Water Committee, Mr. Fletcher, on behalf of the Workington Corporation, moved that the Crummock main be scraped from Cockermouth to Workington. Bearing in mind the success which attended the scraping between the intake and Cockermouth, he said he did not think there should be any hesitation in approving of his resolution. The gain in delivery to Workington had already been 11 million gallons on the quarter; and this quantity would, without doubt, be increased by continuing the scraping. The cost could not be much more than £200. The motion was carried without a dissentient.

Dorking Ratepayers Reject the Water-Works Purchase Scheme.—The result of the poll of the owners and ratepayers of Dorking on the resolution of the District Council to promote a Bill in the ensuing session of Parliament with the object of acquiring the undertaking of the Water Company has been declared, and is very disappointing to the local governing body. The figures were: Against purchase 985; in favour 518—majority against 467. Between 1500 and 1600 voting papers were distributed, a large number of which were not returned to the collectors, while 170 were not filled up either way. In consequence of this adverse vote, the Chairman of the Council (Mr. J. W. Palmer) and two other members (Messrs. Clift and White) have given notice of their intention to resign.

ELECTROLYSIS OF GAS AND WATER PIPES.

Report to the American Water-Works Association.

At the last Annual Meeting of the American Water-Works Association, a valuable paper on the "Electrolysis of Underground Metal Structures," due to the operation of electrical street railways, was read by Mr. Dabney H. Maury, Engineer of the Peoria (Ill.) Water-Works Company. The paper was noticed in the "Electric Lighting Memoranda" in the "JOURNAL" for the 25th of September last year; the conclusion arrived at by the author being that either the double-trolley or the conduit system offers the only perfect means of keeping current out of the ground and preventing electrolysis. The Association were so impressed with the importance of the matter dealt with by Mr. Maury, that they appointed a Special Committee to make recommendations for their guidance in dealing with the problem, and to formulate an expression of their attitude on the question. Mr. Maury was a member of this Committee; his two colleagues being Mr. G. H. Benzenburg and Mr. J. Waldo Smith. The Committee duly presented their report, which is to be acted upon by the Association at their next meeting. We have been favoured by Mr. Maury with a copy of the document, as well as of the paper above referred to; and we give the former practically in its entirety. Having briefly referred to the terms of their appointment, the Committee proceed to say that the following facts are established:—

1.—A very large number of mains and service-pipes have been already actually destroyed by the stray return currents of electric railways operating under the single-trolley system; many instances of such destruction of pipes by these currents having been reported from practically every city where the single-trolley system has been in use for any considerable length of time. Even where the action is too slow to be immediately discovered, the life of the mains and service-pipes is inevitably greatly shortened and their value thereby necessarily proportionately decreased.

2.—In the single-trolley system, no matter how large the capacity of the return feeders, nor how good the bonding of the rails, and even when the continuous rail is used, some electric current will, under the law of divided circuits, flow along the water-pipes; the amount of this current bearing the same proportion to the total current used that the conductivity of the return path of which the water-pipes form a part bears to the total conductivity of all the return paths offered to the current. As neither the rails nor the pipes can practically be insulated from the soil in which they are laid, the proportion of current conveyed by the pipes is considerable, even with the best track-bondage known to modern science, including the welded joint.

3.—The electric current, once on the pipes, must leave them to return to its source—the generator; and wherever the current leaves the pipes to pass through the soil, the pipes are damaged.

4.—Electrolysis also results from differences in potential between water-pipes and any other underground metal conductor such as gas-pipes; and as long as the return current is not entirely removed from the earth, such action will continue.

5.—The extent of the electrolytic injury at any point is directly proportionate to the number of amperes of current leaving the pipe. The smallest measurable difference of potential is sufficient to produce electrolysis.

6.—A cast-iron water-main is not a continuous electric conductor; and its joints offer very much higher resistance than an equal length of the plain pipe.

7.—The inevitable effect of any resistance at the joints is to cause a part of the current carried on the pipes to be shunted around the joint, either through the soil on the outside or through the water on the inside, or by both paths.

8.—Wherever the current leaves the pipe to pass around the joint, either outside or inside, or both, the pipe is injured. The action of the fraction of an ampere flowing around successive joints will in time do great aggregate damage to any cast-iron main on which it flows.

Your Committee is convinced, after careful consideration of reliable data on the subject, that there is no known practical method by which owners of underground pipes can protect them against electrolytic injury from single-trolley currents; but that there are two methods of operating electric railways by which the return currents can be kept out of the ground—namely, the conduit system, as in use in New York City and in Washington (D.C.), and the double overhead trolley system, as operated in Cincinnati (Ohio) and on suburban lines in the district of Columbia.

The conduit system is more expensive to construct, and is peculiarly adapted to the larger cities. The first cost of installing a double-trolley system would be a little greater than that of a single-trolley system for the same service; while the cost of converting an existing single-trolley system to a double-trolley one would be trifling as compared with the enormous interests endangered by the single-trolley current.

Ten years' experience with the double trolley in Cincinnati proves that this system is entirely practical, possesses many advantages over the single trolley, is more economical in operation and maintenance, and completely stops the injury to the pipes.

Your Committee therefore respectfully makes the following recommendations:—

1.—Street railway companies should be compelled, as are electric light companies, and all other electric power companies, to provide a complete metallic circuit for their current, absolutely insulated from the rails and ground. This will keep the return currents out of the ground and off the pipes; and it can be accomplished either by the conduit system or by the double overhead trolley system.

2.—No connections by which a current is carried to the pipe, or induced to flow thereon, should be allowed from pipes to rails, or to other return conductors; and no other alleged remedy which permits the mains to carry any portion of the return current should be countenanced by those in charge of water-works plants. Even the failure to prohibit or to protest against such connections might be construed by law to be a tacit consent on the part of the water-works management to the use of the pipes as conductors, and might relieve the electric railway company from responsibility for the injury which would inevitably result if the mains were allowed to convey current.

In the further discharge of the duties for which it was appointed, your Committee respectfully submits for your approval the following preamble and resolutions, as an expression of the attitude of this Association on the question of electrolysis:—

Whereas the report of the Special Committee on Electrolysis shows that wherever the single-trolley system is in use a portion of the return electric current will flow on the water-pipes, that whenever water-pipes become positive to rails or gas-pipes or other underground metal structures the water-pipes are injured, and that whenever water-mains, whether positive or negative to the rails, convey electric current they are liable to injury thereby near the joints; and whereas it further appears from the said report that there is no known practical method by which owners of water-pipes can protect themselves against electrolytic injury resulting from the operation of single-trolley cars, but that electric railways may, by means of the conduit system or of the double overhead trolley system, be operated successfully and economically, and without any injury to the water-pipes; now, therefore, be it resolved—"That the American Water-Works Association, as a national organization, herewith unanimously maintains that street railways have no right to so operate their cars as to cause injury and destruction to water-pipes;" and be it further resolved—"That street railways now operating under the single-trolley system ought to be required to remove their return current from the ground, and that, if they continue to operate by current transmitted from the power station to motors on the cars, they should be required to provide a complete metallic circuit of sufficient capacity to convey all the current, and in a manner absolutely to insulate it from the rails and from the earth."

BUXTON GAS AND WATER SUPPLY.

Extensions at the Works.

Last Tuesday, Mr. F. H. Tulloch, M.Inst.C.E., one of the Inspectors of the Local Government Board, held an inquiry in the Town Hall, Buxton, relative to an application made by the Urban District Council for a Provisional Order to sanction the borrowing of additional moneys for the purposes of their gas and water undertakings. The Clerk (Mr. J. Taylor) explained that the existing borrowing powers were: Under the Gas Act, 1870, as authorized, £20,000, repayable in 50 years, all borrowed and expended 1871-4; under the Buxton Local Board Act, 1873, £15,000; under the Provisional Order, 1878, £15,000; and under the Order of 1881, £10,000—making a total of £40,000, in respect of which there had been sanctioned and expended £37,895, leaving £2105 available. The summary showed: Act of 1870, £20,000; do. of 1873 and Provisional Orders, £37,895—total, £57,895. There was outstanding on March 25, 1900, £41,108. The repayments made since then up to Dec. 31 amounted to £568; the balance outstanding was £40,540; and there was invested in Consols under sinking-fund arrangement, £665. The debt on the gas-works was therefore £39,875. The total borrowing powers were up to £60,000, and the balance outstanding—£40,000—was still owing. The only difference was that under the Gas Act the Council had 50 years allowed, but under the Local Board Act only 30 years. The Gas Engineer and Manager (Mr. H. Barker) submitted an estimate he had prepared for the work proposed, which will be carried out entirely under his control. He stated that in 1890 the make of gas was 50,292,000 cubic feet, the number of consumers 1050, and of public lamps 286; whereas last year the make was 102,687,300 cubic feet, there were 1536 consumers, and the public lamps numbered 432. The Inspector remarked that the consumers had increased nearly 50 per cent. Mr. Barker added that the make of gas had gone up more than 100 per cent. The Inspector inquired how the electric light affected the consumption. The Clerk replied that it induced people to burn more gas. So far as they could judge, they did not think the electric light would cause a decrease in the quantity of gas consumed; and he believed this was the general experience. The Inspector said the figures submitted showed a great increase up to last year, but they had to look to the future; and the question was whether the proposed expenditure of £26,000 was really required. He took it that the electric light would, to some extent, reduce the consumption of gas in private houses; and probably it now affected the public lighting. The Clerk said that very few of the private houses had the electric light; and the Vice-Chairman of the Board (Mr. Harrison) pointed out that the town would extend considerably during the next five or six years. The Inspector said he should like figures as to this. Mr. G. Smedley (the former Manager, and now the Consulting Engineer to the Council) said the works were constructed to produce 250,000 cubic feet of gas per diem, but they were making close upon half-a-million. The Inspector said it did not seem fair to assume that the works would double themselves in the next ten years when they had a rival. Mr. Barker remarked that in other towns where the electric light had been introduced the consumption of gas had been fully kept up. The Clerk said that many of the proposed extensions ought to have been carried out five years ago. The Council did not purpose spending the whole of the £26,000 at once. Mr. Barker put in a detailed estimate, and said a gasholder would be required now, but not the whole of the retorts. Mr. Harrison said he was quite convinced the proposed works were absolutely necessary to meet the consumption of gas in the height of the season. At present they were working at very great disadvantage and at a loss. Mr. Smedley said the only addition made since the works were constructed in 1876 had been a small washer. He entirely supported the evidence that had been given by Mr. Barker. The inquiry was then adjourned, and in the interval the Inspector arranged to pay a visit to the gas-works.

On resuming, the Inspector proceeded to consider the application for additional borrowing powers in respect of the water undertaking. The summary submitted by the Clerk showed that £15,000 had been authorized by the Act of 1875, and £40,000 by Provisional Order—together, £55,000. Of this sum £49,647 had been sanctioned and borrowed, and £1400 not borrowed; leaving £3953 available. The Surveyor (Mr. W. H. Grieves) gave particulars of the proposed storage reservoir at Cold Springs, which will have a capacity of rather over 2 million gallons (equal to 30 days' supply for the enlarged district), and of the other works contemplated, and the inquiry closed. The result will shortly be known.

COAL AND COKE PRICES IN 1900.

An article on the above subject in the current number of the "Iron and Coal Trades Review" contains the following remarks on the prices of gas coal and coke:—

Up to about the middle of 1899, the values of gas coal had not been seriously affected. Some of the leading gas companies made large contracts in March of that year at 8s. 6d. per ton, which was an advance of about 2s. per ton on the contract rates of the previous year. Between September and December, 1899, there was a rise in nominal quotations of 4s. 6d. to 5s. per ton, and in January, 1900, the unique price of 20s. was quoted; but very little business was done at that figure. When, however, the time came round for the large gas companies to make their yearly contracts, between March and June of 1900, the price generally paid was 17s. to 17s. 6d. per ton; and this figure practically continued until the end of October, with a nominal rise to 18s. in September. Some of the principal gas companies refused to contract for the full twelve months at the high figures of March and April, 1900; and six months' contracts were entered into—under protest in many cases—by both coalowners and gas companies. The general range of prices throughout the last two years is shown in the following table; and it will be noted that the year closes at 6s. 6d. less than the beginning:—

—	Newcastle-on-Tyne.	Sunderland.	Barnsley.
1899.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Jan.	9 0 to 9 6	..	8 0 to 9 0
Feb.	8 3 ,, 8 6	9 0 to 9 3	8 0 ..
March	8 6 ..	8 3 ,, 8 6	8 3 ,, 8 6
April	9 0 ..	9 0 ..	8 6 ..
May	9 0 ..	..	9 0 ,, 9 3
June	10 0 ..	9 6 ,, 10 0	9 0 ,, 9 6
July	9 6 ,, 10 0	9 6 ,, 10 0	9 6 ,, 10 0
Aug.	10 3 ,, 10 6	10 0 ..	9 6 ,, 10 6
Sept.	10 6 ..	10 6 ,, 11 0	9 3 ,, 9 6
Oct.	11 0 ,, 11 6	11 0 ,, 11 6	10 0 ..
Nov.	13 0 ..	..	9 3 ,, 9 6
Dec.	15 0 ,, 15 6	..	10 0 ..
1900.			
Jan.	20 0 ..	18 6 ,, 19 0	12 6 ,, 13 6
Feb.	17 0 ,, 17 6	17 0 ,, 17 6	12 6 ..
March	17 0 ..	16 6 ,, 17 0	11 0 ,, 12 0
April	17 0 ,, 17 6	17 0 ,, 17 6	11 6 ,, 13 0
May	17 0 ,, 17 6	17 0 ,, 17 6	12 0 ,, 12 6
June	17 0 ..	17 0 ..	13 0 ,, 14 0
July	17 0 ..	15 6 ,, 17 0	13 0 ,, 13 6
Aug.	17 6 ..	14 6 ,, 16 0	13 0 ,, 13 6
Sept.	18 0 ,, 18 6	16 0 ..	13 6 ,, 14 0
Oct.	17 0 ..	16 0 ,, 17 0	13 0 ,, 13 6
Nov.	15 0 ..	15 0 ,, 16 0	13 0 ,, 13 6
Dec.	13 6 ,, 14 0	13 6 ,, 14 0	13 6 ,, 14 0

Owing to the relatively limited supply of coke, the price rose to a higher level, and at an earlier date, than coal prices. Within six months—from May to November, 1899—it rose from 15s. to 27s. 6d. per ton, which was more than any corresponding advance in the price of coal. In December, 1899, Durham coke was quoted on Teesside at 32s. 6d.—a figure which had the inevitable result of forcing up the price of pig-iron beyond what it would probably otherwise have been. The rise in South Wales and in Yorkshire was not so great for furnace coke, although in July of 1900 Welsh foundry coke touched 38s. per ton. In December, 1900, coke had fallen to 18s. on Teesside, 23s. 6d. in South Wales, and 16s. in Yorkshire. The rise in coke prices has been one of the most striking features of the boom. Three or four years ago the coal used in Yorkshire for coking was a drug at 3s. 6d. per ton, which meant that the coke cost at the most 8s. per ton; and after about a year of really astonishing business, prices have not only seriously given way, but the outlook has become anything but satisfactory, and many ovens have been put out in the North of England and elsewhere.

RIPON CORPORATION GAS-WORKS.

Additional Borrowing Powers.

Mr. E. P. Burd, of the Local Government Board, held an inquiry at Ripon last Wednesday regarding an application by the Corporation for the issue of a Provisional Order, to partially repeal, alter, or amend the City of Ripon Act, 1865, and the Ripon Order, 1898, so that further borrowing powers might be obtained for gas-works extension, as well as to increase the number of members of the Gas Committee from five to seven, and to give additional powers for the purchase of stoves and gas-fittings. The Town Clerk (Mr. M. Kirkley) stated that the Corporation purchased the gas-works in 1865, and secured borrowing powers to the extent of £18,000, of which £1300 only remained to be paid off. By the Order of 1898, further borrowing powers to the extent of £10,000 were obtained, of which £9500 remained to be paid off. The demand for gas was constantly increasing, partly by the extension of the city boundaries and the consequence of further public lighting. Although £7000 was put down as required, the Corporation asked for amendment of the Order of 1898, that they might, with the consent of the Local Government Board, borrow any further sums that may be necessary without seeking another Order. They desired more members of the Committee, because it was often difficult to obtain a quorum with only five. They also asked for the repeal of the original provision constituting the Mayor for the time being Chairman of the Committee. Power was also sought to purchase stoves and gas-fittings out of capital instead of revenue. The rateable value of the city was given at £38,411, and the debt at £74,347; the general district rate being 3s. 4d., and the poor rate 2s. 8d. for the year. The Gas Manager (Mr. E. E. J. Anderson) stated that during the last six years there had been an increase in the gas made of 58·28 per cent., the maximum daily make having increased 84·22 per cent. The output of gas had gone up from 25 million cubic feet to 40 millions last year. There had been an increase in consumers from 800 to 1394. The estimate of expenditure under the Order of 1898 was £10,100; and the amount actually spent was £9706. The expenditure for mains exceeded the estimate by £625, as many were found in a worse condition than was expected. The principal items now put down were: For new retort-house, £1450; new mains, £1100; chemical-works, £800; new holder, £2000; new meters and stoves, £1000, &c. The leakage last year was 16 per cent., against 23 per cent. the previous year. The defective holder was responsible for much of the leakage. He expected an increased income and less expenditure this year. The Mayor (Mr. J. Spence) and Alderman Lee spoke in support of the application.

PROGRESS OF COVENTRY'S GAS-WORKS.

Looking backward over local developments in the past century, the "Coventry Herald" makes the following remarks concerning the gas supply: It was 21 years after the opening of the century that gas first came to be used in Coventry; before then the streets were feebly illuminated by oil-lamps. The present gas-works were privately erected in 1821, at a cost of £20,000, and were afterwards carried on by a Company. In 1856 the Gas Company obtained powers to supply Allesley, Coundon, Stivichall, Foleshill, Radford, and Stoke; and this was done in regard to the last three places. About that time, the works were partially rebuilt, extended, and improved. The Corporation acquired the gas undertaking in 1884 for £170,345. Then the charges were 3s. per 1000 cubic feet inside the city, and 3s. 6d. and 4s. outside. Now the price to Coventry householders is 2s. 6d.; and a few months ago was even less—2s. 4d. In the last year of the Gas Company, the consumption amounted to 184,855,000 cubic feet; for the year ended March last, it was 555,970,000 cubic feet. In 1896, the necessity for increasing the output led the Council to sanction the erection of water-gas plant, at a cost of £7000; and the following year it was decided to duplicate the plant, which involved the expenditure of another £3500. In October last, the existing works being found too cramped for the increasing needs of the city, it was determined to erect auxiliary works at Foleshill at a cost of £130,000, made up as follows: Land and preparation, £11,250; trunk main from works to Coventry, £14,000; manufacturing plant, £98,270; contingencies, £6480. The buildings, &c., will have a productive capacity of 2½ million cubic feet of gas a day; but the carbonizing machinery is designed to produce only half that quantity. This, however, can be increased at will. The complete scheme will allow of the manufacture of 15 million cubic feet per day. It is plainly evident, therefore, that ample room has been provided for future extension. The total capital raised in respect of the city gas undertaking is £219,429, of which £189,780 is outstanding. The £130,000 for the Foleshill works will, when borrowed, bring the amount obtained on loan for gas purposes, since 1884, up to £349,429. The sum paid over from the gas profits in relief of the rates since 1884 is £36,614.

ILKESTON GAS-WORKS UNDER THE MUNICIPALITY.

The Town Clerk's Story.

On New Year's Day, the Town Clerk of Ilkeston (Mr. Wright Lissett) gave, at the meeting of the Corporation, a succinct retrospect of the town during his connection of nearly forty years. Among the important events, he referred to the transfer of the gas-works, which was brought about by the old Gas Company applying for a Provisional Order. Before then, he said, the Company had no parliamentary powers, and no authority to open streets. The Corporation decided that then was the time to oppose them, because they saw that, if the Company obtained the powers sought, their works would be extended. They were already using the Corporation roads; and they considered there would be nothing immoral or wrong in their opposing, because, if they did not, the streets would fall into the hands of a private Company when they ought to remain under the control of the ratepayers. The Local Board saw that this was clearly the proper thing to do; and the Provisional Order was opposed before a Committee in the House of Commons. In the meantime, efforts were made to purchase the undertaking; but there were a few who determined to have a large price, which the Local Board from the first refused to give. Negotiations were continued for some time. At length the bargain was struck in the Lobby of the House of Commons by which the gas-works were transferred to the Corporation, at the last moment, for £25,000. If the Company had had their Provisional Order, the works would have been worth £50,000, instead of £25,000. This £25,000, instead of going into the pockets of the Company, went into the ratepayers' pockets. The opposition cost the Corporation £420. After they had made this bargain, they were not in a position to supply gas; so that it was necessary to apply for another Order authorizing them to supply in the district. They were successful at a cost of another £420. In 1898 they obtained a further Bill at an outlay of £620; and in 1899 they applied for a Provisional Order for the supply of electricity, and were successful. Last year they had to go to Parliament for an Order for an extension of the gas-works, in which they were again successful. This only cost them £180.

ELECTRIC LIGHTING NOTES.

The Maidstone District Council have settled a contract for their electric lighting buildings, amounting to £7226 11s. 6d.

The electric current from the West Hartlepool Corporation Electricity Works was first turned on to all consumers who were prepared to use it last Thursday night.

Several persons, when crossing one of the thoroughfares in Southsea last Wednesday, were suddenly brought to the ground through a leakage in an electric lighting cable. The Mayor (Alderman Emanuel) who was passing in his carriage, sustained a slight shock.

The Stourbridge District Council intend to apply to the Board of Trade to extend their Provisional Order for the supply of electricity for

two years. Regarding the site the Council propose to acquire for the purpose of a generating station, there has been some question in the Law Courts.

The Ross District Council have unanimously consented to the application by a Company for a Provisional Order for the supply of electric light in Ross. The Company promoting the scheme will have a capital of £8000; and it is estimated that the outlay on the installation will be £7800. The maximum cost for the current will be 8d. per unit; and the net price 7d.

Last Thursday Colonel Durnford, R.E., one of the Inspectors of the Local Government Board, held an inquiry relative to the application by the Wigan Corporation to borrow £16,500 for electric lighting purposes. It was stated that the Board had already sanctioned the borrowing by Wigan of £85,000, and the additional sum was required to meet demands for current in the streets not hitherto provided for.

A painter named George Trussler, of 27, Shaw Road, Royton, while engaged in painting an upright post support for wires at the electric tramway station in Oldham, suspended his can from one of the "live" wires. The consequence was that on touching the can he received a severe shock, which threw him to the ground. He was removed to the infirmary, where it was found that he had sustained internal injuries of a serious character, and he had to be detained.

The Auditor of the Local Government Board (Ireland) who recently examined the accounts of the Dublin Corporation, has surcharged certain members of the Electric Lighting Committee with payments made to effect necessary alterations in the electric light supply to private consumers—amounting, in the aggregate, to about £2000. The members surcharged are those who voted for the expenditure of the money and signed the cheques. They number 15, and include the Lord Mayor.

Three Magistrates sat at the Dale Street Police Court, Liverpool, last Friday, to further investigate the charge against Mr. Edwin Isherwood of having abstracted electricity from the system of the Corporation. It was shown that there had been an extraordinary diminution in the consumption of electricity by defendant, and evidence of tampering with the service connections was tendered by a boy who had been discharged from defendant's employ, and who had been heard to say that he would be revenged. The Magistrates were unanimous in considering the charge not proved.

Under the General Acts governing electricity supply, the Local Government Board have no power to sanction loans for free-wiring. The Swansea Corporation were told so a few weeks since; and now the same information has reached the Dudley Corporation. Speaking on the subject at the meeting of the latter body last Tuesday, Alderman Dunn expressed his astonishment that Government officials should be so bound with red tape. The Committee propose to venture another application; and if this does not succeed, they have (so the Alderman says) another way of getting round the difficulty.

At a recent meeting of the Electric Lighting Committee, the City Electrical Engineer of Belfast (Mr. Victor A. H. M'Cowen) submitted a statement as to the progress of the electricity undertaking during the past twelve months. On Dec. 31, 1899, there was an equivalent of 51,500 8-candle lamps connected to the mains, and there are now 73,500—an increase of 43 per cent. There are also applications for a further 10,000 lamps. The output for the year 1899 was 622,500 units sold. The estimated output for 1900 was 875,000 units—an increase of 40 per cent. The average price obtained for current supplied during 1899 was 4·36d. per unit; for 1900, owing to the reduction in price introduced at the beginning of the year, it will work out at about 3¾d. per unit.

The small consumers of electricity in the City are complaining already at the change in the scale of charges for current by the City of London Electric Lighting Company, to which reference was made last week. At the price of 8d. per unit per 8-candle lamp for the first six units in the March and December quarters, the man who only switches on the current for about an hour during the winter months, and perhaps not at all in the summer, will have to pay for the total amount of current used at a much higher rate than he who consumes for many hours a day. The City tradesmen who close at six, and the men whose office hours are from ten to six, consider that the revision will discourage the general use of electricity; while Mr. Frank Bailey, the Company's Engineer, says the question is a serious one for them.

The Cleckheaton District Council have approved the recommendation of a Committee that application be made to borrow sums of £19,260 and £5740 respectively for carrying out schemes for the supply of electrical energy in the Council's district, and for the provision of a refuse destructor. The proposal includes provision for the supply of motive power for the tramway to be laid in the district by the British Electric Traction Company, connecting the town with Heckmondwike and Dewsbury. The Engineers estimate that the scheme will involve an annual expenditure of £1463 on account of the loan and working expenses, and that there will remain a small balance of profit after supplying 36,000 units for lighting and general power purposes at an average charge of 5½d. per unit, and 100,160 units for the tramway at 1½d. per unit.

There was great jubilation in the United States on the last day of the Old Year and the Nineteenth Century; the inhabitants, according to a special telegram to the "Daily Express," "giving, in the swelling pride, joy, and prosperity of 125 years of independence, an impressive farewell to the Nineteenth Century," and hailing the Twentieth, "with song, dance, and illumination, and a general outpouring of welcome." The telegram proceeded: "Electricity lights out the old and lights in the new. Everywhere electrical illumination is the chief feature. It is thought fitting that the crowning scientific development of the period passed should cross the threshold of a new and greater time in its own dazzling light. Here, in New York, Manhattan Island is aglow from street-level to the tops of the sky-scrapers. . . . Just before midnight, the lights will be switched off; and, as the clocks strike midnight in total darkness, the lamps will flash up again, and the Twentieth Century will be born in effulgence."

In the "JOURNAL" for Nov. 6 last year, reference was made to the arbitration proceedings between the Canterbury Corporation and the Assessment Committee of the Board of Guardians, with regard to the assessment of the electric light undertaking of the former. The Guardians' valuer put the gross value of the works at £1050, and the rateable value at £700; the gross value of the dust destructor at £300, and the rateable value at £250. The valuation amounted to 24 per cent. of the gross receipts of the undertaking, which, it was submitted, was a proportion very much higher than that usually reached; and the Corporation appealed. The Recorder of Canterbury (Mr. Frank Safford) was the Arbitrator; and at the Epiphany Sessions last Wednesday he announced his decision. He found that the electric light works and the dust destructor were capable of being separately assessed; and that the gross value of the former had not been placed too high, but that the deductions made therefrom were insufficient. He fixed the rateable value of the works at £370; and that of the destructor at £180. The respondents have to pay the costs of the appeal.

LONDON WATER QUESTION.

The County Council's New Purchase Bill.

The Bill to empower the London County Council to acquire the undertakings of the Metropolitan Water Companies, of which notice was given in November, has been deposited. It is divided into nine parts, with a preamble; and there are 28 sections, followed by a schedule.

The preamble opens with the statement that London and an adjoining area in the counties of Middlesex, Surrey, Kent, and Essex are dependent for their water upon eight Companies, who have combined, "by arrangement not sanctioned or authorized by Parliament," to divide the supply between themselves, and to refrain from mutual competition. The Acts under which the Companies carry on their operations are then enumerated, and it is stated that by virtue thereof there has been no rivalry between them, and that they have generally charged the ordinary domestic consumer the full maximum rate, which varies considerably in different districts. Reference is next made to the circumstances which led to the passing of the London Water Act in 1892, under which the County Council were empowered to promote Bills relating to the supply of water in the Administrative County and within the limits of supply of the Companies, and to the appointment of Lord Balfour's Commission in the same year. The parliamentary inquiry conducted by Sir Joseph Pease in 1896 is then alluded to, and the portion of the Committee's report quoted in which the opinion is expressed that it would be greatly to the public interest if both the Water Companies and the inhabitants of London were speedily freed from the anomalous position in which they were placed. It is next pointed out that, under the Staines Reservoirs Act, 1896, provision was made that, in the event of any of the three Companies concerned (the Grand Junction, New River, and West Middlesex) being acquired within seven years, otherwise than by agreement, by any public body or trustees, no claim was to be made in respect of any advantages conferred by the Act. The appointment and work of Lord Llandaff's Commission of 1897 is noticed, and the sentence from their report, in which they express the opinion "that it is desirable that the undertakings of the Water Companies should be acquired and managed by a public authority," is cited. The preamble closes by setting forth that, in order to avoid further delay in finally settling the question of the water supply of the Metropolis, it is expedient that provision should be made for forthwith placing the undertakings of the Companies and of the Staines Reservoirs Committee in the hands of a "public representative authority," in the manner subsequently specified.

Passing over Part I. of the Bill, which consists of the short title and the interpretation clause, Part II. provides for the transfer of the waterworks by agreement or arbitration. Failing agreement, the transfer is to take place in each case at "the end of the financial year of the Company current at the passing of the Act"—*i.e.*, December, 1901, or March, 1902; or the date may be varied by agreement. For settling the affairs referred by the Act to arbitration, an arbitrator or arbitrators are to be appointed; and if no one is specially named in the Act, the Council and the Companies may agree to have either one or three persons as arbitrators, or they may each appoint one and ask the Court of Appeal to nominate the third. The arbitrators may appoint skilled assistants to advise them on any matters upon which they desire information. The Council are to pay for the undertakings such a sum of money as the arbitrators may determine to represent the "fair and reasonable value," together with "such further sum as the arbitrators may award to meet the cost of re-investing such money." In order to ascertain the amount to be paid, the arbitrators are to "inquire into and consider all the circumstances of the case;" but "no allowance shall be made in respect of compulsory purchase." The Council are to have power to inspect the works and books of the Companies.

Part III. of the Bill contains provisions incidental to the transfer. The Council are to have power to issue stock, annuities, or other security in discharge, wholly or in part, of the amount of the consideration-money agreed upon. Until the date of the transfer, the undertakings are to be carried on by the Companies as hitherto; but anything done after Nov. 1, 1900, is not to continue in force against the Council unless they adopt it in writing. In the event of their declining to do this, the matter is to be referred to the arbitrators. From the date of the transfer, the Council become subject to the liabilities of the Companies in respect of their debenture stock. The purchase-money is to be paid either to the Directors or into Court, as may be determined, and until it is paid the purchasers are to pay interest thereon. The books, deeds, and documents of the Companies are to be transferred to the Council, who will take over pending actions. Any question arising as to the adjustment of accounts is to be referred to the arbitrators.

Part IV. of the Bill deals with the position and duties of the existing officers and servants of the Companies, who are to pass over to the Council in the same positions and at the same emoluments which they hold and receive, and are to be compensated for any abolition of office. Part V. provides for the dissolution of the Staines Reservoirs Joint Committee. The two clauses in Part VI. will give the Council power to further combine the various systems of distribution, but not to take from the Thames any more water than the Companies are entitled to draw. Part VII. refers to the management of the undertakings, which is to be placed in the hands of a Committee to be appointed by the Council; but it may comprise as members "representatives of other bodies and persons not being members of the Council." The single

clause contained in Part VIII. relates to the powers to be given to the extra-Metropolitan Councils and the Local Authorities outside London. It sets forth that the Council on the one hand, and the Councils of the Counties of Middlesex, Surrey, Kent, Essex, and Hertfordshire, and the Councils of county or municipal boroughs or urban or rural districts within the above-named counties, or any of them, on the other, may enter into agreements for the sale or transfer "of so much of the mains, pipes, and works of distribution acquired by the Council as is exclusively appropriated to the distribution and supply of water within the extra-Metropolitan county or the district of the Local Authority, together with the rights and powers of supplying water therein, and of making charges in respect thereof, which will have been transferred to the Council; or they may arrange to furnish a supply of water in bulk to any extra-Metropolitan Council or Local Authority for sale by them within their district.

The concluding part of the Bill deals with accounts and finance. Clause 28 sets forth as follows :—

(1) The Council shall establish a special water fund, comprising separate accounts for capital and revenue, to which shall be carried all receipts arising from the water undertaking of the Council, and out of which all expenditure connected with the water undertaking, including interest on stock and provision for redemption thereof and annuities (if any), shall be paid; and such fund may be either separate and distinct from, and not form part of, the county fund, or may be a separate account of the county fund. (2) Moneys from time to time received by the Council in respect of any sales or disposition of lands forming part of the water undertaking, and any other receipts of a capital nature, shall be paid into the capital account of the special water fund, and applied in or towards expenditure on capital account, or to provide for the redemption of stock. (3) If the moneys at any time standing to the credit of the special water fund shall be insufficient to meet the expenditure payable thereout, the deficiency shall be made good out of the county rate of the Administrative County of London as a payment for general county purposes.

All the costs and expenses of the Council in obtaining and in the execution of the Act, except so far as they may be met out of the moneys derived from their water undertaking or may be otherwise provided for, are to be defrayed as payments for general county purposes, in accordance with the provisions of the Local Government Act, 1888. The sinking fund held by the Chamberlain of London is to be transferred to the Council, and applied by them either in aid of the purchase of the undertakings, or set aside as part of a sinking fund for the redemption of the capital sunk therein.

WOLVERHAMPTON WATER-WORKS BILL.

A Large Expenditure Contemplated.

A Special Meeting of the Wolverhampton Town Council was held yesterday week, to consider the advisability of promoting in the next session of Parliament a Bill to empower the Corporation to construct additional water-works, to extend their limits of supply, to make further provision in regard to the water undertaking, and for other purposes. Alderman Marston (the Chairman of the Water Committee) sketched the history of the Company who first provided the supply of water to the town. Owing, he said, to the increase of population, and for sanitary and other purposes, it had become necessary to augment the supply; and if the Bill were passed, water would be required, by the time the works were completed, for a population of 210,000. To give this number 25 gallons per head per day, a total quantity of 5,200,000 gallons would be required. It was therefore proposed in the Bill to erect pumping-stations in the parish of Worfield, convey the water to Sedgley, and construct reservoirs at Tettenhall and Sedgley. It was also proposed to extend the limits for the supply of water to Patshull, Pattingham, Badger, Boscobel, Claverley, Rudge, Ryton, Shifnal, Tong, and Worfield. The total expenditure was estimated at £200,000, of which £16,252 would be spent at Cosford, £33,340 at Tettenhall, £14,200 at Goldthorn Hill, £25,000 on extensions and mains, and £111,000 on new works at Worfield. He moved that the Bill be promoted. Mr. Perkyn, in seconding, emphasized the fact that it was absolutely necessary to spend more money at Cosford; while at Tettenhall an improvement must be effected by providing a new reservoir. Alderman Gibbons anticipated that the Bill would be opposed by the owners of land and property in the district of Worfield; and he suggested that they should be met in a fair and honourable manner. In the past people had had their water taken from them by the Corporation, and they had had no redress. He might say that years ago people were robbed of their water. The Town Clerk objected to such a remark. Alderman Gibbons repeated that the Wolverhampton Corporation had inflicted serious injury on people in the neighbourhood of Cosford. He contended that Stapleford and Hilton, where it was proposed to put down boreholes, were out-of-the-way places, and that the cost of conveying coal for the pumps would be very heavy. Alderman Mander also thought there would be serious opposition to the Bill from the landowners; and he suggested that that part of the Bill should not be pressed at present. Alderman Jones contended that Wolverhampton must secure a supply of water; and no doubt the property owners could be conciliated. Mr. Berrington (Chairman of the Health Committee) held that the property owners would be able to make satisfactory terms with the Corporation. The present borehole at Cosford was incapable of yielding a sufficient quantity of water; and a further supply must be obtained from somewhere. Personally, he objected to water being taken from the Cosford Brook, as there was no filter in the market that would stop typhoid germs getting into the pipes. The motion was unanimously adopted.

Gas Suffocation Case at Coventry.—A servant named Florence Stanley (aged 19), engaged at Beech House, Foleshill, Coventry, was suffocated by gas during the night of Saturday, the 29th ult. She was accustomed to sleeping with a jet of gas burning; and on the Sunday morning, she was found in bed dead, and there was an overpowering smell of gas in the room. The gas-tap was slightly turned on. The room was unventilated; and the Jury at the inquest commented on this in returning a verdict of "Accidental death."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

An action by the Edinburgh and Leith Gas Commissioners for recovery of the price of gas consumed, amounting to £14 11s. 2d., has been decided in the Sheriff Court in Edinburgh. In this case, the man sued went further than is usual. He not only pleaded that the meters were inaccurate, but that the introduction of water-gas plant without legal or any notice to him was the cause of the meters recording 100 cubic feet of gas where only 60 cubic feet had passed. The meters were tested and reported on; and, after hearing the evidence, Sheriff-Substitute Reid gave decree for the sum sued for, with expenses. He said the defender did not challenge the readings of the meters as stated in the account sued for, but maintained that they did not accurately register the quantity of gas consumed. The two meters were overhauled by the Inspector of Meters, in January, 1900, and both were found to be slow—showing that a considerable quantity of gas had been consumed by the defender for which he was not being charged by the pursuers. New meters, which were placed in the defender's premises on the removal of the old ones, were also tested (on May 17, 1900); and one was found to be slightly fast—recording ½ per cent. more than was allowed by statute against the consumer. The balance, however, of all the testings was largely in favour of the defender, who was being charged for considerably less gas than he had used. The decision was appealed by the defender to the Sheriff Principal, who, however, affirmed it, with further expenses. Though not mentioned in the judgment, the plea about water gas was repelled as untenable. It was, of course, a layman's plea that carburetted water gas caused meters to register incorrectly; and the defender had no evidence in support of his contention. It is impossible to say how he would have worked out his theory. This is of no consequence scientifically, because he was an uninformed man; but legally the argument was of more importance, because had the defender obtained the ear of the Bench upon it, it might have got among the decisions that carburetted water gas could not be measured by ordinary gas-meters, and it would not have been easy to have set that aside. There is no law more obnoxious, or more tenacious, than judge-made law. It has happily been avoided in this instance.

It was inevitable that some journalistic notice should be taken of the proposal of the Corporation of Glasgow to lower the illuminating power of the gas supplied to the city. It came in the "Glasgow Daily Mail" of yesterday, in a leading article headed "Less Light for Glasgow." I cannot say that the article helps anyone in any degree. Naturally, the writer, not being an expert, has no policy. Having stated the proposal of the Gas Committee, he proceeds: "This appears to be a serious matter for the citizens; and therefore the cause requires to be clearly explained. A reduction of 20 per cent. in the illuminating power of the gas will make a very great difference in the lighting of houses. With the gas of lower quality, it will take five burners to give the amount of light that four burners give at present. A decrease in illuminating power that necessitates such an increase in the number of burners, cannot but be regarded by a large class of the community with considerable apprehension and disapproval." In these sentences, he is heading directly against the proposal to lower the illuminating power; but then, after having aroused hostility, instead of proceeding to show how to avoid the reduction, he runs off into the question of price, which, in this matter, is not of the essence of the proposal. He asks: "When the inferior gas is introduced, shall we still have to pay the present price? The question is of the first importance. If the illuminating power of the gas is reduced by one-fifth, it stands to reason and justice that the price ought to be reduced by one-fifth. The charge for the 20-candle power being 2s. 6d. per 1000 cubic feet, the charge for the 16-candle power should be only 2s. We do not forget that before the rise in the price of coal the charge was 2s. 2d.; but we fear that because of the dearness of coal the gas will never in proportion to its illuminating power be so cheap again. The Corporation give us this assurance—that the gas will be as cheap as they can make it. Their policy is to sell it at cost price; and if it can be made at 2s., it will be sold at 2s. With this assurance the citizens will have to be content. The great gas-works of Glasgow have been extremely well managed; the gas has been cheaper than in other cities; and its price will continue to be no higher than is absolutely necessary." Now, in all this there is not much that can be objected to, unless it be the postulate that the price of gas must be proportionately reduced to the illuminating power. Very little reflection, I am sure, is necessary to satisfy anyone of the folly of this position. If the two matters are to stand in the same relative positions as at present, they may as well be allowed to stand where they are. Had the writer been acquainted with his subject, he would have known that, unless there is a prospect of being able to reduce the price of gas far more than the proportion in which the illuminating power is lowered, the change is never likely to be made by Mr. Foulis. The point of the proposed alteration has been altogether missed; and, indeed, the general conclusion arrived at is so tame as to be unworthy to follow the heroics with which the article began. But though the spirit raised by this mild form of sorcery was a very small one, still it was a spirit, and of the evil nature too, as is found to-day by the appearance of a letter in the same newspaper, over the signature of "Lux," in which the gas supply and the lighting of the city generally come in for a good deal of abuse. The conclusion this writer comes to is that, if the gas is further reduced in illuminating power, they will "have to burn more, and to pay more for it, too." If this should be the result, truly the Gas Committee would be bereft of reason who should propose to make such a change; but is not the letter suspiciously like a crying out on the part of the writer before he is hit?

From Glasgow to Strathaven is a long descent; but I am obliged to make it by the appearance in the "Hamilton Advertiser" to-day of two letters, both anonymous, in which the gas supply is most severely handled. Had there been only one letter, I would have passed it over as being only one of the many choleric productions which pass under notice, relative to gas supply; but there being two in one week, and both making the same complaints, gives countenance to the view that there must be something to write about. The complaints are as to the want of illuminating power, and bad smell. There are other diatribes in both letters; but these are the pillars upon which they all rest. The

main charge is contained in the following passage, which I give chiefly because it is an exquisite specimen of the sort of tall writing which is frequently to be met with in such documents as these: "To glance along our streets one of these dark December nights, is nothing less than a nightmare. Were these fine street-lamps living things, how they would blush with shame at the indignity to which they are put in sheltering in their expansive interiors the sickly-looking, trembling little indigo flame, with its border of orange yellow, the feeble ray of which is perhaps good enough to prevent the casual wayfarer cracking his head against its supporting post, but fails utterly in the *raison dêtre* of its existence. Indoors, besides poverty of light, our nostrils are constantly assailed by a vile, penetrating, sulphurous odour, which ascends from the piping with disgusting freedom, whether gas is being used or not. This particular phase of the question is of recent date, and is, I understand, the result of some late improvements (*sic*) at the works, which provide for the making of gas, or rather profits, with the lowest qualities of coal." Is not the labour here altogether incommensurate with the object? It is evident there is something wrong with the purifying plant in the gas-works; and it may be taken for granted that of this fact there is no one more painfully aware than the Gas Manager.

Mr. High, of the Dundee Town Council, is not disposed to allow the subject of coal analysis to slumber. He brought it before the Council once before, and again this week, when he said they were still deeper in the mire than ever. For the past month, there were four defaulting coal contractors. The losses were £49 13s., £12 9s., £70 3s., and £23 2s. respectively. In all, they had lost £155 7s. on 1532 tons of coal. They used 6000 tons in the month. He moved that they stop taking coal from the defaulters, and that other be bought against them in the open market. It was pointed out that the Committee had already recommended this policy, and that the Council had agreed to it. The subject accordingly dropped.

On the railway to the north of Aberdeen this week, I acquired information upon two subjects which I consider worth repeating. The first was a conversation overheard. The chief speaker was a young man of that intelligent class who, possessed of half knowledge, realize that there is a better state possible than the present, and, groping after it, fall into the specious views of the Socialist. His talk was of the doings of the Gas Workers' Union. From the tone of decision with which he spoke, he seemed to me to be one of the Committee. At any rate, he was well acquainted with all the doings of that body. "Aye," he said, "there's going to be a big strike in the Aberdeen Gas-Works. The last time they tried it, they took it at an awful bad time; but they're all right this time. They've better heads at their backs; and, besides, they've the shore labourers on their side, for, you know, they're all one now." This may be information to Mr. Smith and his Committee. I quite accept that this man was an optimist among Unionists, and eager for a struggle, and that it by no means follows that a strike will take place. But the remark shows the spirit which is abroad among workmen, and the necessity there is for securing, and keeping, the goodwill of the working staff. There are two good reasons why there should be no strike—the season is already past, and there is a large amount of unskilled labour going idle in the district—but it will be inadvisable to look upon the situation in a light mood.

The other subject had reference to the price of coal. In this instance, the man speaking was one who had worked at ammonia stills in iron-works, and is now employed in a coal pit. He was fair in his attitude to the extent of admitting, without its being put to him, that the miners are always ready to take advantage of their masters when they can; but, he added, any advantage they can take is as nothing compared with that which the coalmasters have taken of the public for a year past. The miners, he went on to say, have got a minimum wage of 8s. per day. The average working of a man is two tons per day; and so the wage has, with exceptions in the case of watery mines or thin seams, been fixed at 4s. per ton. But if a man should get into an easy place, and be able to win three tons of coal per day, he would not get 12s. His pay would be cut down to, perhaps, 3s. 6d. per ton, so that his wage would be 10s. 6d. per day; and the coalmaster would pocket the other 1s. 6d. The public would not benefit by the miners' rate of pay being reduced. In this way, the minimum wage is being used by the coalmasters in a manner which the miners did not anticipate. In this man's view, the action of the coalmasters has been very wicked. Although the price of coal has been so high, the miners have, as explained above, not been earning nearly so much money as on former occasions when coal was dear; and, as compared with a few years ago, the rise in their pay has not been very great. Of course, this is the view of a man in the ranks, and is doubtless a little biassed; but the speaker impressed me with a sense of his fairness, and there was, no doubt, a great deal of truth in what he said. It is a satisfaction to know that the price of coal has come down to the extent it has; but I fear that the satisfaction will be mingled with gall to those who have contracts to run for several months yet at the high rates.

The new gasholder at Denny, which was damaged in the great gale of a fortnight ago, has been righted; and on the afternoon of Saturday last the gas was turned on to it by ex-Provost Shanks, who was for many years Convener of the Gas Committee. Mr. Porteous Laidlaw, of the Barrowfield Iron-Works, Limited, the Contractors, and Mr. J. M'Gilchrist, of Dumbarton, the Engineer, were present.

A conference was held in Edinburgh yesterday between representatives of the Edinburgh and District Water Trust and the Peebles County Council, with reference to the proposal of the Trustees to get parliamentary authority to an extension of time by five years for the completion of the new water-works. The County Council were inclined to oppose, on the ground that while the works are in progress there is an exceptionally heavy traffic on the roads of the county, which throws extra assessment upon the ratepayers, to the amount of £200 a year. It was pointed out for the Water Trust that their expenditure in the county will be over £1,000,000, and that as soon as the works are completed there will be a new assessable subject, of the value of about £30,000. An agreement was come to, under which the Trustees are, for whatever time may be required over the original period of ten years, to pay to the county any sum which may be proved to have been incurred on account

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 78.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	19—20	..	5 5 0
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	Jan. 2	5	Australian 5 p.c. Deb.	99—101*	..	4 19 0
200,000	5	Nov. 14	6	Bombay, Ltd.	6—6½	..	4 12 4
40,000	5	,,	6	Do. New, £4 paid	4—4½	..	5 6 8
380,000	Stk.	Aug. 15	12	Brentford Consolidated	255—260	..	4 12 4
270,000	,,	,,	9	Do. New	183—188	..	4 15 9
50,000	,,	,,	5	Do. 5 p.c. Pref.	137—142	..	3 10 5
159,375	,,	Dec. 13	4	Do. 4 p.c. Deb.	115—118	..	3 7 10
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig.	220—230	..	4 6 11
226,320	,,	,,	7	Do. A. Ord. Stk.	150—160	..	4 7 6
1,003,500	Stk.	Aug. 29	5	Bristol, 5 p.c. max.	121—123	−1	4 1 4
420,000	20	Sept. 28	10	British	39—41	..	4 17 7
50,000	10	Aug. 15	12	Bromley, Ord. 10 p.c.	24—26	..	4 12 4
79,000	10	,,	9	Do. 7 p.c.	19—21	..	4 5 8
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	8¼—8¾	..	6 17 2
220,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95—98*	..	4 1 8
150,000	20	July 12	8½	Cagliari, Ltd.	23—25	..	6 12 0
100,000	10	Sept. 28	8	Cape Town & Dis., Ltd.	13½—14½	..	5 10 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
550,000	Stk.	Oct. 12	12⅞	Commercial Old Stock	275—280	..	4 11 1
236,425	,,	,,	9⅜	Do. New do.	207—212	..	4 12 0
238,237	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	132—137	..	3 5 8
800,000	Stk.	Dec. 13	9	Continental Union, Ltd.	165—170	..	5 5 11
200,000	,,	,,	7	Do. 7 p.c. Pref.	165—170	..	4 2 4
555,000	Stk.	Aug. 15	5¼	Crystal Palace Ord. 5 p.c.	117—122	..	4 6 1
60,000	,,	,,	5	Do. 5 p.c. Pref.	130—135	..	3 14 1
486,030	10	July 27	11	European, Ltd.	18½—19½	..	5 12 10
354,060	10	,,	11	Do. £7 10s. paid	13½—14½	..	5 13 9
14,993,075	Stk.	Aug. 15	4 4/16	Gas-light and Coke	4 p.c. Ord.	−1	4 11 8
2,600,000	,,	,,	3½		3½ p.c. max.	..	3 14 6
3,799,735	,,	,,	4		4 p.c. Con. Pref.	..	3 7 10
3,993,975	,,	Dec. 13	3		3 p.c. Con. Deb.	..	3 2 6
70,000	10	Oct. 26	8	Hongkong & China, Ltd.	13—14	..	5 14 4
3,800,000	Stk.	Nov. 14	10	Imperial Continental	203—208	..	4 16 2
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
561,000	Stk.	Aug. 30	10	Liverpool United A	231—234	..	4 5 6
678,100	,,	,,	7	Do. do. B	173—175	..	4 0 0
306,083	,,	Dec. 28	4	Do. do. Deb. Stk.	120—122*	..	3 5 7
75,000	5	Dec. 13	6	Malta & Medn., Ltd.	4⅞—5¼	..	5 14 3
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	105—108	..	4 12 7
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	104—106	..	4 4 11
541,920	20	Nov. 14	3½	Monte Video, Ltd.	9½—10½	..	6 13 4
667,946	Stk.	Aug. 30	9¼	Newc'tle & G'tesh'd Con.	215—220	+2½	4 4 1
299,855	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	101—102* *Ex. div.	−2	3 8 8

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
150,000	5	Nov. 29	8	Oriental, Ltd.	7—7½	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	5¾—6¼	..	5 15 3
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¾—1¾	..	4 11 5
60,000	5	Sept. 28	7	Ottoman, Ltd.	5—5½	..	6 7 3
851,070	10	Oct. 12	7	River Plate Ord.	10—10½	..	6 13 4
250,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	98—100*	..	4 0 0
250,000	10	Sept. 28	8	San Paulo, Ltd.	11—12	..	6 13 4
135,000	Stk.	Sept. 14	10	Sheffield A	232—236	..	4 4 9
203,700	,,	,,	10	Do. B	232—236	..	4 4 9
447,427	,,	,,	10	Do. C	232—234	..	4 5 6
5,641,885	Stk.	Aug. 15	5¼	South Met., 4 p.c. Ord.	131—136	+2	3 18 5
1,520,000	,,	July 12	3	Do. 3 p.c. Deb.	95—98	..	3 1 3
380,940	Stk.	Nov. 14	5	Southampton Ord.	107—112	..	4 9 3
70,825	,,	July 12	4	Do. 4 p.c. Deb.	117—122	..	3 5 7
120,000	Stk.	Aug. 30	6	Tottenham and A. 5 p.c. B. 3½ p.c.	112—117	..	5 2 7
250,520	,,	,,	4½		85—90	..	5 0 0
61,550	,,	Dec. 13	4	Edmonton 4 p.c. Deb.	110—115	..	3 9 7
182,380	10	Jan. 12	5	Tuscan, Ltd.	7—8	..	6 5 0
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	95—100*	..	5 0 0
				WATER COMPANIES.			
780,499	Stk.	Dec. 28	11	Chelsea, Ord.	303—308*	..	3 11 5
150,000	,,	,,	5	Do. 5 p.c. Pref.	155—160*	..	3 2 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	142—145*	..	3 2 1
175,785	,,	Sept. 28	4½	Do. 4½ p.c. Deb.	143—148	..	3 0 10
1,720,560	Stk.	Oct. 12	7	East London, Ord.	193—198	..	3 10 8
654,740	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	147—152	..	2 19 3
797,687	,,	,,	3	Do. 3 p.c. Deb.	98—100	..	3 0 0
700,000	50	Dec. 13	8	Grand Junction 10 p.c. max.	109—112	..	3 11 5
310,000	Stk.	Sept. 28	4	4 p.c. Deb.	130—135	..	2 19 3
708,000	Stk.	Aug. 30	14	Kent	303—308	..	4 10 11
160,000	,,	,,	7	Do. New, 7 p.c. max.	200—210	..	3 6 8
1,043,800	100	Dec. 28	10½	Lambeth, 10 p.c. max.	290—295*	−3	3 11 2
406,200	100	,,	8	Do. 7½ p.c. max.	208—213*	..	3 15 1
350,000	Stk.	Sept. 28	4	Do. 4 p.c. Deb.	127—130	..	3 1 7
500,000	100	Aug. 15	14	New River, New Shares	415—420	..	3 6 8
1,000,000	Stk.	July 27	4	Do. 4 p.c. Deb.	128—133	..	3 0 2
902,300	Stk.	Dec. 13	7	South-wark and Ord. 7½ p.c. max. 5 p.c. Pref.	193—198	+1	3 10 8
126,500	100	,,	7		185—190	..	3 13 8
489,200	Stk.	,,	5		155—160	..	3 2 6
1,019,585	,,	Oct. 12	4	Vauxhall 4 p.c. A Deb.	128—133	..	3 0 2
1,155,065	Stk.	Dec. 13	10	West Middlesex.	280—290	..	3 9 0
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
200,000	,,	Sept. 14	3	Do. 3 p.c. Deb.	98—100 *Ex. div.	..	3 0 0

of extra traffic upon the roads during the construction of the water-works. The County Council will not now oppose the Provisional Order which the Trust are promoting.

In the coming session of Parliament, the burgh of Irvine will be promoting a Provisional Order giving them power to construct additional water-works. At present the burghs of Saltcoats and Ardrossan, and the town of Stevenston, are supplied with water from the Irvine Corporation Water-Works. In the Provisional Order, it is proposed to enact that Irvine shall have a prior claim upon the water. This is objected to by the Local Authorities in the other towns, who perceive that in a time of scarcity they would be left without a supply. A meeting of the Northern District Committee of the Ayr County Council was held on Thursday, to consider the Provisional Order; and at this meeting it was urged that the proposed claim of Irvine to priority should be opposed. About 70 per cent. of the water, it was said, is consumed outside the burgh of Irvine; and seven-tenths of the rates, and of the sinking fund and the cost of maintenance, are contributed by outsiders. In these circumstances, the representative of Stevenston considered that there should be no priority of claim upon the water. There was no opposition to this proposal on the merits; but on account of a statutory provision, the subject was sent to the County Council, to be dealt with by that body instead of by the District Committee.

GAS RESIDUALS MARKET IN THE PAST YEAR.

Reviewing the progress of the market for residual products during the year 1900, it may be said that the revival of 1899 was continued, and that prices throughout were in a healthy state, with one or two exceptions. Benzols, at least, did not fail to maintain the better tone which characterized them during 1899. With regard to the fluctuations which have occurred, there has been much similarity between the year which has just closed and its predecessor. Taking 90's and 50's respectively, the year started at 7½d. and 10¼d. in each case. By the middle of February values had eased off to 7d. and 9d., and hovered thereabouts until the end of March. April opened easier, and proved the worst month of the year; the lowest prices being 6d. and 8⅛d. respectively. During May, 90's made very little improvement; but 50's began to advance. Early in June there was a turn for the better, and values rose to 8⅛d. and 10d. During July the same tendency to rise held good until the first advance on the year was reached at 9⅜d. and 10½d. From this point onwards, benzols never looked back. In August and September 10⅜d. and 11⅛d. were the current prices, to be followed in October by 11⅛d. and 1s. At the beginning of November, the record prices for the year were attained by 90's standing at 11d. to 1s. and 50's at 1s. 1⅜d. and 1s. 2d. This increase tended to quieten the demand a little, but not sufficiently to cause prices to fall lower than 10d. to 1s. for 90's and to 1s. 1d. for 50's. Pitch was not very encouraging. The price advanced 4s. per ton on the east coast and 3s. on the west during the year; but at the close prices were about 1s. to 1s. 6d. per ton lower on the year. The best months were May and June. The market kept steady during the next three months; but there was a gradual decline in prices all along, so that the year closed at 30s. to 33s. for east coast and 28s. to 30s. for west. Creosote was most disappointing; and prices fell steadily all through the year, in spite of the prospects of its being used for fuel, owing to the advance in coal. The first drop came in April, and it was followed by another fall in May, when the price ranged from 2¼d. to 3d., as against 3¼d. at the beginning of January. The summer months were featureless; but with September, prices fell to 1½d. to 2d. All the hopes of a change for the better during the next two months proved futile; and December saw a nominal 1⅝d. as the closing price. Heavy (grease) oils, in like manner, were dull, and lost 7s. 6d. per ton on the year. Carbolic acid was not so firm as the general trend of affairs would naturally have led one to expect. The prohibition placed upon it, in conjunction with picric acid, unsettled both the home and export trade; and when the order forbidding its export was cancelled, things did not revive to the extent expected. All the same, the year was not without its favourable aspects. Taking crude carbolic as a guide, the first two months were satisfactory; prices keeping at 2s. 10d. and 3s., and even once touching 3s. 4d. in February. During March and April 2s. 8d. was nearest value, which held good up to the end of September, with the exception of a brief spurt in May. The last three months, however, proved disappointing, and prices gradually fell, the year closing at 2s. 5d. Naphthas were not very interesting. Crude was dull, and after running up to 5d. in February, gradually lost ground, and closed at 4½d. Solvent naphtha has been in better demand of late, but was weaker on the year. Opening at 1s. 4d., the price fell to 1s. 2d. in March, which soon gave place to 1s. 1d. in April; and with the exception of a brief rally in August to about 1s. 3d., dropped to a lower figure, and closed the year at 1s. 1½d. Sulphate of ammonia was fairly satisfactory. Opening at £11 to £11 2s. 6d., prices gradually rose until the middle of March, when £12 to £12 2s. 6d. was reached. In June, however, they fell, and closed at £10 15s. to £10 18s. 9d. We shall notice the progress of the sulphate market at greater length when Messrs. Bradbury and Hirsch issue their "Annual Review."

The Slough Water Company last Wednesday summoned a consumer for £2 8s., water-rate. Defendant admitted that £1 18s. was due, but disputed the remaining 10s., which had been charged for a garden hose. The charge was specified in the Company's regulations, but no agreement existed as to it between them and the defendant. The Bench gave judgment for £1 18s. only.

The Directors of the Brighton and Hove General Gas Company have given instructions to Mr. Alfred Richards to sell £20,000 of their "A" ordinary stock, and our readers will see, by an announcement which appears elsewhere, that he will do so at the Mart next Monday. This stock ranks for a standard dividend of 7 per cent., subject to the sliding-scale; and the last paid was at this rate.

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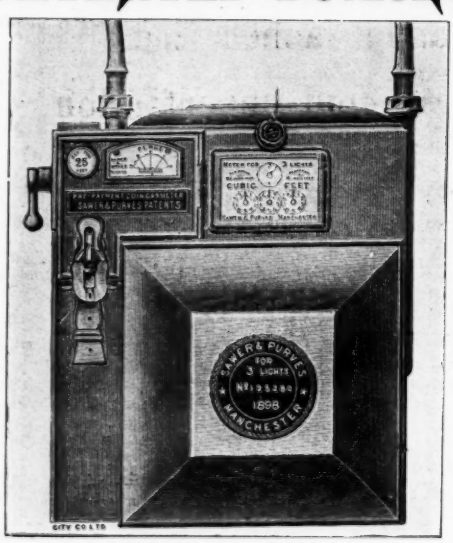
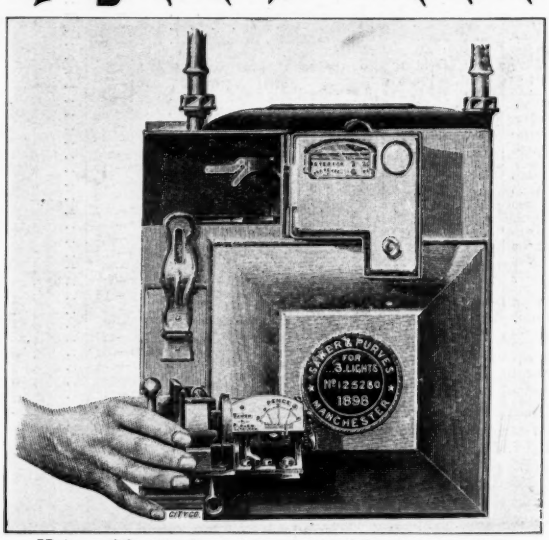


Meter in working position.



Meter with attachment removed without uncoupling.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 5.

Sulphate of Ammonia.—Business has again been somewhat broken by holidays; and at the close it has scarcely been restored to a normal condition, though quotations remain at £10 16s. 3d. to £10 18s. 9d. per ton, delivered f.o.b. at the ports. Demand has been smaller; but, on the other hand, makers, being fairly well cleared out in December, have not been very anxious to sell January until the month is fairly started. There is good inquiry in the forward position, but no important business is reported, makers being very firm.

Nitrate of Soda remains steady at 8s. 3d. to 8s. 6d. per cwt., according to quality, on spot.

LONDON, *Jan.* 5.

Tar Products.—The lower prices of small coal seem to have benefited the consumption of pitch. Fuel makers are now able to obtain coal at a reasonable price, and more briquettes and therefore more pitch are going into consumption. This appears to have stopped the fall in value that was somewhat marked during December. The strike at Antwerp, however, has restricted shipments somewhat. But this appears now to be settled; and it is said shipments will be resumed on a large scale at once. Benzols are steady, with considerable business doing for the first six months of the year. There are buyers, however, for the whole twelve months, which looks as if the improved value in this formerly much neglected article will be maintained. Naphthas are not quite so firm. Creosote and heavy oils are extremely weak. Carbolic is moderately steady; and anthracene is dull and weak.

Average prices may be taken as: Tar, 14s. to 18s. Pitch, east coast, 32s.; west coast, 29s. Benzol, 90's, 10d. to 1s., according to position; 50's, 1s. 1d. Toluol, 1s. 3d. Solvent naphtha, 1s. 1½d. Crude naphtha, 4½d. Heavy naphtha, 1s. Creosote, nominal, 1½d. Heavy oils, 2½d. Carbolic, 60's, 2s. 6d. Naphthalene, 90s.; salts, 60s. Anthracene, "A," 3½d.; "B," 2d.

Sulphate of Ammonia shows no change. Prices in all positions continue about the same as quoted last week. Stocks, having regard to the season, are low, and value at all ports may be taken at an average of £10 16s. 3d. per ton, less 3½ per cent.

The South African Lighting Association have, as a local paper puts it, carried the war into the enemy's camp by recently opening a showroom in the Arcade at the Mutual Buildings, which are to be lighted by electricity—when the installation is complete. As was the case with the Gas Company at the great Paris show, the Association are first in the field; and, according to the account to hand, they are making a splendid display with high-power incandescent gas-burners. The new room is in a central position, and the Manager of the Association (Mr. W. Arnott) has brought together an excellent collection of burners, fittings, stoves, &c. It is intended to arrange a series of cookery demonstrations by an expert lady from England. Increased business cannot fail to result from such enterprise.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Operations in the coal trade are only just getting round again into their ordinary course after the holidays; and so far as present business is concerned, there is very little in the position generally to call for special note. For all descriptions of fuel there is a moderately good demand, but not that scarcity of supplies which followed the holiday stoppages last year. At many of the collieries it has been necessary to fill up something out of stock; but there has been no difficulty in meeting all the requirements of consumers. Last January, preparations were being made for an advance in prices; but this year list rates are not being more than maintained, and large consumers, in place of being eager to give out their contracts, are generally holding back for lower prices than coalowners at present seem willing to concede. What coalowners are generally talking of as the extent to which they are prepared to go in reducing prices on forward contracts, is about 1s. per ton; and they do not seem to anticipate that they will have to give way more than this, even on the gas or locomotive fuel contracts. Inquiries with regard to these are not yet upon the market; so that what the gas and railway companies may think about the situation is at present altogether problematical. But the large users of fuel for manufacturing purposes certainly do not regard the coalowners' conditions as any sufficient inducement for placing long forward contracts. As a result, quite a number of important contracts, which would otherwise have been settled before the close of last year, are still in abeyance; and for the most part consumers are preferring to go on practically from hand to mouth, rather than contract at all far ahead, unless they can obtain some more substantial concession, as there is no doubt a general belief that prices will be very much lower later on in the year. As to current rates, these remain without quotable change, and average about as follows: Best Wigan Arley, 16s. 6d. to 17s. 6d. per ton at the pit, Pemberton four-feet and seconds Arley 15s. to 15s. 6d., common house coal 14s. to 14s. 6d., steam and forge coals 12s. to 12s. 6d., and engine fuel from 10s. 6d. for good medium sorts to 11s. and 11s. 6d. for best qualities. Steam coal is about 14s. 6d. to 15s. per ton delivered at the Mersey ports.

Northern Coal Trade.—After the interruption of the holidays, business was only slowly resumed; and the work at the collieries has for the past week been partial only. Thus the shipments of coal have been below the normal average; but they included large quantities of gas coal on the long contracts running at the high prices ruling a few months ago. In the steam coal trade, the demand is not a very brisk one; but the collieries have now a little work ahead. Though prices droop, yet for best Northumbrian steams the quotation varies from 13s. 6d. to 14s. per ton f.o.b.; while for steam smalls about 7s. is the current price. For gas coals, the price in the market may now be taken as about 12s. 9d. to 13s. per ton f.o.b.—a price that shows a rather sharp fall from the quotations that were made down to about

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two months or so ago. Deliveries of gas coal are still heavy; but there seems to be an abundant supply, which contrasts greatly with the condition of the trade at this time last year. In coke, lower values generally prevail; and this has its influence on gas coke. For blast-furnace coke, about 18s. per ton at the furnaces is the price; for export coke, 21s. to 22s. per ton f.o.b. In gas coke, the price is now about 20s. 2d. per ton, delivered in Newcastle; and there is a corresponding fall in the same kind of coke for export.

Scotch Coal Trade.—The past week was a holiday one in Scotland, and consequently little business was done. There are no formal quotations; but it was announced on Saturday that coalowners in the West of Scotland had reduced the price of splint by 2s., making it now 11s. per ton at the pit, and that the coalowners in the Lothians had resolved to reduce the price of household, steam, and nut coal by 1s. per ton. During the last week of the past year, the shipments amounted to 232,825 tons—an increase of 56,322 tons upon the previous week, and of 32,535 tons upon the corresponding week of last year. For the whole year, the shipments were 10,917,214 tons—an increase of 1,910,828 tons upon 1899.

Rochdale Water Supply.—At the meeting of the Rochdale Town Council last Thursday, the Water Committee recommended that the Council should acquire lands below their reservoir at Ramsden Valley, near Todmorden, and construct a new reservoir thereon; and that Mr. J. Mansergh, M.Inst.C.E., be retained to carry out the work. Alderman W. T. Heap, the Chairman, in answer to questions, said the estimated quantity of water in their reservoirs was equal to 2 million gallons per day. This was besides compensation water. In their reservoir near Todmorden there was a supply equal to 259,000 gallons per day. If all the houses in the town and district were provided with water for the water-carriage system, the consumption would be increased from 19 gallons to about 25 gallons per head, or about 30 per cent., which would be equal to an additional consumption of 600,000 gallons per day. Their present consumption was about 2 million gallons daily. It was therefore about equal to the supply in their present reservoirs; so that if the town were put on the water-carriage system, the available supply would be all used. He thought it desirable to consider the advisability of tapping some lakes, but not Lake Windermere, as it was only 134 feet above the sea-level, whereas Rochdale was 392 feet. The only lake that could supply Rochdale by gravitation was Haweswater. All the towns round were eagerly looking up new sources of supply, as they were getting very scarce of water, and it was time that Rochdale did its best, because, in any case, even with the reservoir they were going to make, they would only have sufficient water for about a dozen years, whereas Manchester, Liverpool, and Birmingham had made provision for a supply for the next fifty years. If a number of towns could unite and decide to bring water from Haweswater, he believed it would be much better than constructing a number of small reservoirs up and down the country for different localities

Water-Main Bursts at Whitacre.—Some trouble has lately been experienced with the main, 36 inches in diameter, through which water is pumped from the reservoir at Whitacre to Birmingham. A few weeks ago it was found necessary to repair an injury to it near the pumping-station, and on Wednesday last it burst at a spot between Whitacre and Forge Mills. Information was immediately sent to the offices of the Corporation Water Department, and a large gang of men were despatched to the scene of the breakage. Other workmen were sent from Whitacre, and steps were immediately taken to repair the main. Owing to the recent heavy rains, some difficulty was experienced in getting at the breakage in consequence of the volume of water in its vicinity. Two steam-pumps were, however, set to work; and eventually the mischief was remedied with comparatively little inconvenience to the consumers. The officials of the department were congratulated by the Water Committee for the promptitude with which the repairs were effected.

Leeds Water-Works Extensions.—The Leeds City Council decided last Wednesday to promote a Bill to enable them to construct additional water-works. It was explained that the scheme might add £2,000,000 to the capital account of the works. But it was necessary to look ahead, and especially in view of the fact that the hands of the Corporation had to some extent been forced by the action of other authorities in dealing with the area that most of the members of the Council had ear-marked for the benefit of the city. Alderman Cooke, Chairman of the Water Committee, urged the necessity of a large and comprehensive scheme, and mentioned that in 1876, when the Washburn water was first brought to Leeds, the daily consumption was 7 million gallons, whereas now it was 16 millions. It was a matter of absolute necessity that the Corporation should apply for power to carry out another scheme in addition to the existing one, so as to enable them to deal with the ever-growing necessities of the city. At the statutory meeting of owners and ratepayers last Thursday, consent was given to the promotion of the Bill.

Rugby Water Bill.—In consequence of substantial opposition to one clause of the Bill which is being promoted in Parliament by the Rugby District Council, by which they seek power to construct a reservoir at Newton at a cost of £70,000, a poll of the town has been demanded. This has led the Council to reconsider their position; and, at a recent meeting, Mr. T. A. Wise, the Vice-Chairman, said he had never been in favour of that part of the scheme, because it was not immediately necessary. As an adverse poll would be fatal to the Bill, and defer for several years much needed improvements, he proposed that the Newton scheme be eliminated. This was supported by other members, who had hitherto countenanced the scheme only because the engineering expert advised them to include it in the Bill to save subsequent expense. The Chairman (Mr. T. B. Eden) saw no reason to go back from the Bill in its entirety, and proposed an amendment to that effect. It was, however, lost by a considerable majority, and Mr. Wise's proposition was carried. It was stated that the opposition to the water clauses of the Bill would now in all probability be withdrawn. It was also decided to reduce the £150,000 which the Bill would give the Council power to expend to some smaller sum to be hereafter fixed.

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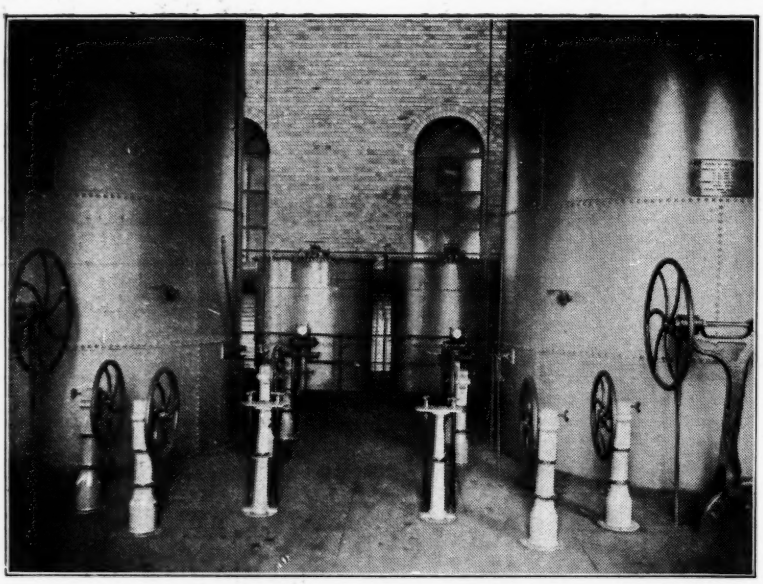

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Mond Gas Scheme.—The opposition to this scheme has been strengthened by the addition of the Stourbridge District Council.

Ilkeston Gas-Works Extensions.—In connection with the extension of the Ilkeston Gas-Works, owing to certain requirements of the Local Government Board in connection with some proposed cottages, the amount of the loan required has been advanced from £4500 to £5500.

Shipley Improvement and Gas Purchase Bill.—On New Year's Eve, a statutory meeting of owners and ratepayers in the area of the Shipley District Council unanimously passed a resolution authorizing the Council to proceed with their Parliamentary Bill under which power is sought to carry out several important schemes, including the acquisition of the undertaking of the Shipley Gas Company. The estimated expenditure under this and one or two other heads is as follows: Gas purchase £228,000, addition required by the Council, £25,000; water-works, £10,000; electrical purposes, £20,000. Terms have been arranged between the Council and the Gas Company for the transfer of the gas undertaking; and no serious opposition is expected in regard to this portion of the Bill, because, although the Bradford Corporation and the Baildon District Council are affected, the Shipley Council have adopted the "dismemberment" clause, under which the authorities named can buy out the rights of supply in their districts by paying the "going concern" price. In the event of Baildon being amalgamated with Bradford, it is expected that the City Corporation will buy out Baildon in addition to the part of the city—Heaton—at present supplied by the Shipley Company.

Municipal Undertakings Capital Expenditure.—The report on this question prepared by the Finance Committee of the Birmingham City Council for their meeting last Tuesday, and noticed in the issue of the "JOURNAL" the same day, was duly presented for adoption by Alderman Clayton. He explained that Mr. Walthall's resolution with regard to the responsibility of capital expenditure had received full consideration, though no alteration could be advised. Mr. Walthall acknowledged the courtesy of the Committee in considering the matter, and repeated at length his reasons for the belief as to the present anomalous position of dealing with capital expenditure. He thinks it desirable that each Committee proposing to spend money on capital account should obtain the specific sanction of the Council so to do. He referred to the report the Gas Committee submitted at the May meeting, and the request for authority to borrow £500,000 for capital expenditure over the next ten years. They were in that case in the position of giving the Gas Committee power to spend the amount upon their own authority. The capital account of the Gas, Water, and Electric Supply Committees was no less than £7,500,000; and the whole of the capital account of the city amounted to £15,500,000. He considered the Council should be supplied in detail with information as to the progress of expenditure. Every Committee should be placed on the same level as regarded outlay, and should come to the Council for sanction. He would make an exception in the case of the three Committees mentioned, but limit their spending responsibility to £10,000. The report was adopted.

Lincoln Water Supply.—The Local Government Board have sanctioned the borrowing by the Lincoln Corporation of £13,500 for ten years for boring for water, with a promise to extend the time for repayment if the works prove successful; and the Water Committee have instructed the Engineer to invite tenders.

Companies Wound Up Last Year.—The following Companies were wound up voluntarily last year: Acetylene Light Syndicate, Incandescent Fire-Mantel and Stove Company. The following were wound up with a view to continued existence in another form: Cape Town District Water-Works Company, Coventry Gas-Fitting, &c., Company, Frank Wright's Prepayment Gas-Meter Corporation, New Sunlight Incandescent Company, and Sardi's Patent Gas Generator Syndicate. A winding-up order was made in the case of the Mantleless Incandescent Gas Corporation.

Minerals under Gas-Works Sites.—At the meeting of the Coventry City Council last Tuesday, the Gas Committee recommended the purchase of additional land at Foleshill for gas-works purposes, at the cost of £300; the minerals being reserved to the vendor (Mr. Coape-Arnold). Mr. Johnson attacked the arrangement as to the reservation. It was known, he said, that this land covered a coal-bed; and in future years it would be the centre of a coal-field as important as that of South Staffordshire. He moved that the report be referred back; and Alderman Fowler seconded. Mr. Calcott doubted if Mr. Coape-Arnold would sell, except on the reservation of minerals; and Mr. Rotherham observed that the London and North-Western Railway Company preferred to give up the coal and ironstone in the district rather than purchase them. On a vote being taken, the Council adopted the Committee's report.

Rotherham's Gas Coal Contracts.—At the last monthly meeting of the Rotherham Town Council, Alderman Mason inquired how the Corporation stood with regard to the coal contracts in view of the prices for gas coal, and whether the Corporation were likely to make a great loss. The Mayor (Mr. G. Gummer), as Chairman of the Gas Committee, said he had forgotten for the moment the exact price contracted for, but believed it was 15s. per ton. It seemed to him that if they had entered into the contracts for six months, as he advised, the probabilities were that they would have been able to secure contracts at the present time which would have saved them a considerable amount of money. He noticed that the railway companies had concluded contracts at a reduction of 2s. 6d. per ton; but he had not seen any instance where gas coal contracts had been made at a reduction. Mr. Jenkinson thought that the Committee adopted a wise course in making contracts for twelve months at the time they did. Certainly the prices of coal had gone down considerably; but who could have foreseen that? To their minds it seemed to be a wise policy to make themselves absolutely secure for a supply of coal for twelve months. He questioned whether they could have made their contracts at a reduced price at the present time. The Mayor pointed out that Mr. Livesey had entered into contracts for six months; and if he had thought it prudent, he (the Mayor) considered they would have acted wisely in following his example.

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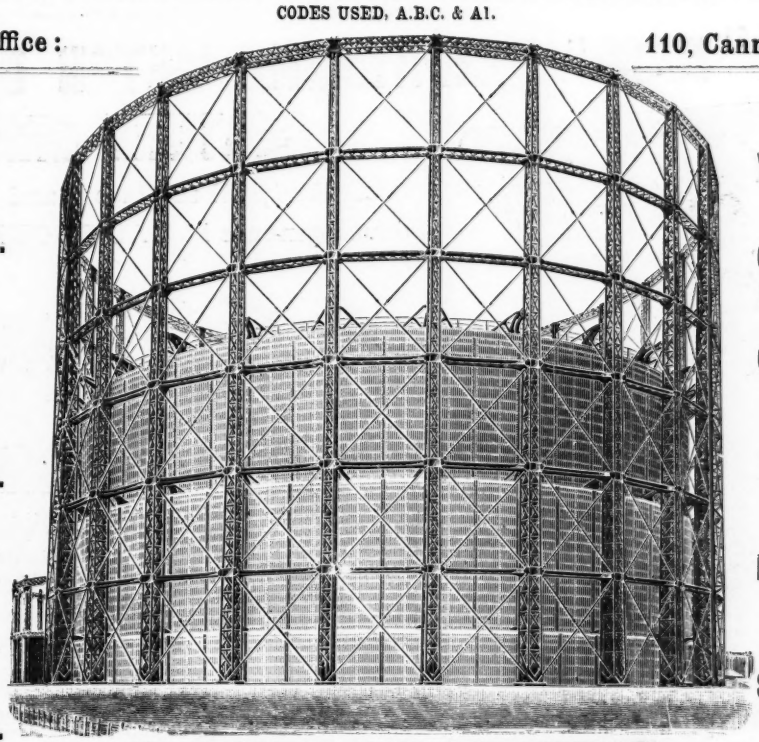

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A Sign of the Times.—The Directors of the Lewes Gas Company have given notice that, owing to the probable reduction in the cost of coal, they feel justified in reducing the price of gas by 8d. per 1000 cubic feet—in the case of ordinary meters as from the survey about March 25 next, and in the case of prepayment meters as soon after that date as the meters can be adjusted.

The Salaries of Gas and Electrical Engineers.—Alderman Snape, of Salford, cannot understand why the Corporation Gas Engineer only receives £650 a year, while the Electricity Committee are offering £700 for an Engineer for their department. He referred to the matter at the meeting of the Council last Wednesday; but so far as we know, no one enlightened the Alderman. Perhaps no one could.

Gas Stokers' Demands at Llanelly.—A short time since the stokers at the Llanelly Gas-Works handed in notices to terminate work which would have expired last Wednesday. But, on the 29th ult., Mr. Morgan, the Local-Secretary of the Gas Workers' Union, had an interview with the Directors; and, after some discussion, it was decided to defer the consideration of the men's demand for an advance of wages for a fortnight, in order that the labour conditions in other gas-works might be investigated. Mr. Morgan consented to the withdrawal of the notices, provided the advance agreed upon is eventually made retrospective.

Worcester and the Water Supply of Pershore.—On Tuesday last, the Pershore District Council considered a communication from the City Engineer of Worcester (Mr. Caink) regarding the water supply of Whittington and Pershore. For the supply of the former place, he had previously estimated an expenditure of £500; but to provide for the supply of an addition to the area would raise the estimate to £807 17s. As to the proposal to supply Pershore from Worcester, there were, he said, no engineering difficulties in the way. The city of Worcester would deliver water to the city boundary at 9d. per 1000 gallons; and he suggested that a reservoir should be constructed at Allesborough Hill, holding about 250,000 gallons, for the supply of Pershore. The proposed works were estimated to cost £8864; and the works would include the cost of supplying Whittington and also a supply to Pinvin. The question was referred to a Committee.

Gas Consumption in Birmingham at Christmas Time.—The consumption of gas in Birmingham during the week ended Thursday, Dec. 27 (Christmas week), was 133,011,000 cubic feet, as compared with 172,973,000 cubic feet in the preceding week. The great difference is accounted for by the fact that work was practically finished on the Saturday before Christmas, and that, except for ordinary lighting purposes, but comparatively little gas was used on the Monday, Christmas Day, and Boxing Day. The returns for the fortnight, however, are far below the corresponding fortnight in 1899. In the week ended Dec. 28, 1899, the consumption was 150,555,000 cubic feet, and in the previous week it was 197,589,000 feet. Indeed, the consumption has been less during the whole of the quarter when contrasted with the corresponding period of the previous year; and the reason assigned is the mildness of the weather and the absence of fog.

Water-Finding at Middlewich.—The problem of increasing the water supply of Middlewich has been for some time engaging the attention of the District Council; and they eventually decided to consult Mr. Mullins, a well-known diviner. He recently met the Council, and proceeded with them to the gathering-ground at Sproston, where he located a number of sources of water.

A Water Scheme for the Longtown District.—The sum of £17,000 is required by the Longtown Rural District Council for the purpose of providing a water supply for the parish of Arthuret and the townships of Kirkandrews Middle Quarter, Kirkandrews Moat, and Kirkandrews Nether. Application for sanction to borrow the amount named having been made to the Local Government Board, an inquiry has been held by Mr. W. A. Ducat. It appeared that the district is at present mainly supplied by shallow wells, which the Medical Officer declares are mostly of an unsatisfactory character in regard to purity. Notwithstanding, a large number of residents are opposed to the new scheme.

Bingley and the Cullingworth Gas-Works.—A meeting of the ratepayers of Bingley was held a few days since for the purpose of determining upon the expediency of authorizing the District Council to promote a Bill in the next session of Parliament to obtain power, among other matters, to purchase the Cullingworth Gas-Works. Mr. W. R. Atkinson, the Chairman of the Council, moved the necessary resolution. He explained at some length the negotiations which had taken place with the view of securing the works, and mentioned that the last offer of the Council for the works was £8320; but the Directors had held out for £10,000. The motion was adopted; but a poll was demanded.

Bilston Gas Company.—At the ordinary general meeting of this Company yesterday, the Directors presented their 55th annual report and statement of accounts. The revenue in the year ending Sept. 30 last came to £25,684; the expenditure, to £20,289—the amount carried to the profit and loss account being £5395. This account, after the payment of the usual interim dividend, showed a balance of £4363, from which it was proposed to pay dividends of 5s. 6d. and 4s. per share on the "A" and "B" shares respectively; making, with the interim dividends, 11s. and 8s. for the year, and leaving a balance of £1678 to be carried forward. The Directors reported that during the year there was an increase of 8¾ million cubic feet in the sales of gas.

West Australian Mechanics' Wages.—We learn from particulars supplied by Mr. John Plummer, of Sydney, New South Wales, that in West Australia, as in older countries, skilled labour usually commands maximum wages, its value being enhanced by the general adoption of the eight-hour system in most of the various branches of industrial activity. In New South Wales, the weekly rates in gas and water meter manufacturing establishments are: Brass finishers, 54s.; coppersmiths, 60s. to 66s.; meter makers, 48s. to 60s.; meter testers, 60s.; painters, 36s.; plumbers and gas-fitters, 30s. to 60s.; and tinsmiths, 54s. In other trades they are: Gas-fitters, 25s. to 60s.; galvanized iron-workers, 42s. to 54s.; plumbers, 35s. to 85s. 6d.; oven makers, 40s. to 50s.; and stove makers and fitters, 30s. to 72s.

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Colwyn Bay Gas-Works Purchase Rejected.—A largely attended meeting of ratepayers was held at Colwyn Bay last Friday to consider the question of purchasing the gas undertaking. A strong appeal was made for support to the action of the District Council; but evidently more telling arguments were advanced in opposition, for the scheme was rejected, and a poll demanded.

Bath Water at Bradford.—At a meeting of the Water Committee of the Bradford Corporation held last Thursday, a deputation from the Baths Committee attended, and asked for a reduction in the scale of charges for water supplied to the public baths. It was pointed out that in many large towns the corporation baths are supplied with water on a much lower scale than in Bradford. Leeds has reduced the charge from 6d. to 3d. per 1000 gallons; York and Coventry pay only 3d.; and Edinburgh and Poplar, 4d. The charge at Hull is £60 a year for each bath; and the water at Oldham, Barnsley, Halifax, and St. Helens is supplied free. The Water Committee said they could not see their way to make any reduction in the charges.

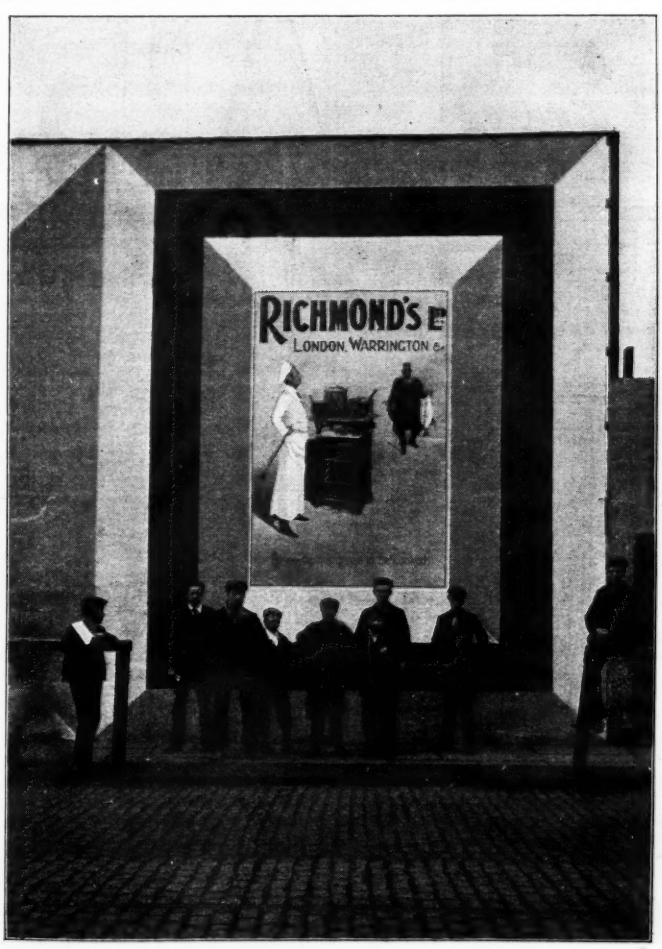
Water-Main Bursts in the City.—The work of laying down the Post Office telephones which is now going on in the City met with unexpected opposition on Ludgate Hill last Thursday. The trenches were suddenly flooded with water, driving the workmen to the surface, and overflowing down the channels into the sewers. Work had to be entirely suspended for a time, and it was no easy matter to discover the cause of the flooding. Obviously a water-main had burst; but the difficulty was to find where. After a good deal of trouble, the leakage was located in the trench between St. Paul's Churchyard and Ave Maria Lane. The main was plugged; but before work could be resumed the men had to bale the water out of the trenches. By the time the night workmen arrived at six o'clock, the effects of the flood had been entirely removed.

Belfast Water Commissioners' Accounts.—At a meeting of the Belfast Water Trust on Thursday, Mr. Dalzell, the Chairman of the Finance Committee, made a statement on the result of last year's operations. He said the total receipts for the year amounted to £69,806; being an increase on 1899 of £1620. Regarding the expenditure on revenue account, interest on loans and dividends on stock absorbed £41,775, and sinking fund £10,700; the total expenditure being £75,653, and leaving a deficit on the year's working of £5847. This had been met by the reserve fund. He also made an interesting statement respecting the working of the Deacon meter system. Reckoned at 2d. per 1000 gallons, the value of water saved was £4824; and the expenditure on the system during the year was £1242—showing a balance in favour of £2581. There could now be no doubt of the success of the system, as the saving up to the present had practically balanced the natural growth of population and trade supply; and had the system not been adopted, there was every reason to believe the city would have been on short supply in the summer season for the past year or two. He also mentioned that the capital expended during the year amounted to £196,728; £142,424 having been paid in connection with the new Mourne works, with which considerable progress had been made.

Gas-Meter Testing in Manchester.—At the annual meeting of the Manchester City Justices last Friday, the Gas-Meter Testing Committee presented a special report upon the subject of meter testing. It showed that the present system of testing is not satisfactory; and the Committee suggested to the Gas Committee of the Corporation that an index test should be applied to meters as well as the usual parliamentary test. The additional cost was estimated at £450. The Chairman of the Gas Committee (Alderman Gibson), however, informed the Justices' Committee that the Gas Committee, having considered the matter, could not, under all the circumstances, see their way to incur the extra expense to effect so little, and were of opinion that if such a course were adopted it should be taken by all corporations, and receive Government sanction. As the result of some discussion, it was resolved to again approach the Gas Committee on the subject.

Underground Water Channels.—Proof of an underground water channel—something rarely accepted by Law Courts—was recently acknowledged, according to the "Engineering Record," by the Maryland Court of Appeals. It is stated as follows in the report: "In an action for diversion of a water course, the evidence was that plaintiffs' mill-dam was supplied with water from a stream and from a spring; that above the dam there was a sink-hole in the stream, and that not far from the stream's bed the spring is located; that the land between the hole and the spring is limestone; that, when muddy water ran into the hole, the water in the spring became muddy; that chaff thrown into the hole would soon appear on the surface of the spring; and that, when the water of the stream ran into the hole, the spring was from 8 to 10 inches higher than when it did not so run." It was held that there was a subterranean channel between the hole and the spring, through which the water from the stream reached the spring, and subsequently the dam.

Mr. Gilbert Little on American v. British Machinery.—Mr. Gilbert Little, of Clevedon, Smethwick, has written a long letter to the "Birmingham Daily Post" to protest against the prominence given to American "skill" and "engineering ability" in devising machinery superior to British, inasmuch as there are no grounds whatever, he says, for such statements; practical and business men being aware that the labour-saving appliances in operation and obtainable in England are as efficient as any in the world, particularly those for the automatic manipulation of grain and coal. He maintains that in the use of these appliances at collieries the Americans are certainly not ahead of us. He directs special attention to the fact that our superiority in labour-saving machinery in gas-works is particularly marked, and is most frankly acknowledged by managers of American gas-works, many of whom have lately visited England to study the improvements effected. With regard to the handling of coal in iron and steel works, where labour-saving devices have not been so generally adopted as in gas-works, Mr. Little says that a few months ago he conducted a gentleman connected with the management of Carnegie's steel works at Pittsburgh over several British works, and he unhesitatingly admitted that the automatic coal-handling plant in operation at modern steel-works near Glasgow was, in every way, superior to anything he had seen in America.



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The South Metropolitan Gas-Meter Case.—We learn that the claim of the South Metropolitan Gas Company against the Borough Council of Bermondsey for the gas consumed at the public baths in Rotherhithe, and incorrectly recorded by the meter, has been amended so as to be confined to the period allowed by the Statute of Limitations—June, 1894, to June, 1900—and proceedings are to be taken in the High Court to recover the amount. The Town Clerk has been instructed to defend the action.

Aldeburgh Water-Works Purchase.—A meeting of the owners and ratepayers of Aldeburgh was held at the Town Hall a few days since, for the purpose of considering the proposal to promote a Bill authorizing the purchase by the Corporation of the undertaking of the Aldeburgh Water-Works Company, and empowering them to purchase land, construct additional works, and raise the necessary money. The Mayor (Mr. G. H. Garrett) explained that it was at first thought desirable to purchase the works by arbitration, and to ask the Local Government Board to assent to the proposal; but the Board would not consent without a specific sum being named. The Directors of the Company were approached, and the purchase-money was fixed at £5000. The Corporation, however, felt that even this sum, if sanctioned by the Local Government Board, would not be sufficient to meet the requirements of the town, and that at least a further sum of £5000 was necessary for a new source of supply, expenditure on engines, and the cost of the Bill and lands. He gave details of the Corporation proposals for raising the money required, and said he anticipated that the step would prove highly beneficial to the town. He concluded by formally moving the necessary resolution, and it was carried.

The number of applications for patents in the United Kingdom last year was 23,909. This is a decrease compared with 1899, when the number was 25,775.

Mr. J. Carter, Gas Engineer to the Lincoln Corporation, has received an increase of £50 per annum in his salary, accompanied by a promise of a similar addition two years hence.

We have received from Mr. Thomas Newbigging a copy of his latest work, "Lancashire Humour." It is illustrated by Mr. J. Ayton Symington, and published by Messrs. J. M. Dent and Co.

The Elland Gas Company have placed an order with Messrs. Thomas Tattersall and Sons, for a steel roof, 54 feet span, for their new retort-house now in course of erection to contain an installation of inclined retorts.

The Committee of the House of Representatives in charge of the Bill to substitute, in the United States in 1903, the metric system of weights and measures for the common system in use, has reported in favour of the change; and there is reason to believe the Bill will become law.

Last Sunday morning, David Henry Lloyd, of Park Road, Newton-le-Willows, was found dead in a bath. He had been employed by the District Council of Newton-in-Makerfield for the last three years, and previous to that was Assistant Gas Engineer to the Wallasey District Council. It is thought deceased had had a fit.

The United Alkali Company have given notice to the St. Helens Corporation that in all probability they will apply for an order for a new trial in the explosion case.

The "Daily Chronicle" stated last Saturday that there had been a decided weakening in the price of coal all round at the previous day's London market; and it was the opinion of several leading merchants that a fall might be expected shortly.

The Water Committee of the Stockport Corporation have accepted the tender of Messrs. Mather and Platt, Limited, of Salford, of £4250 for supplying and erecting at Wilmslow the plant required in the Archbutt-Deeley patent water-softening process.

The Hereford Town Council on the 1st inst. agreed to proposals by the Gas and Water Committees that application should be made for power to borrow £1500 for gas-main extensions, and £3000 for the enlargement of the water-filtering area.

Mr. C. Gott and Mr. Fawcett are to be the Arbitrators in the proceedings to determine the price to be paid for the Menston Water-Works by the Wharfedale Rural District Council. The Company, for whom the first-named gentleman is acting, ask £20,000.

We have received Sugg's "Gas Engineer's Pocket Almanack and Lighting Table" for the current year. It contains the series of tables with which users of the book are now familiar, and illustrated descriptions of the photometers and other appliances made by the firm.

The Durr Light and Burner Company, Limited, has been registered with a capital of £20,000, in £1 shares, to adopt an agreement made between R. J. Eiffe and J. W. Chamberlaine (for the Company) for the sale of certain patents and benefits, and to carry on the business of manufacturers, &c.

The following appeared in "The Times" yesterday as an extract from the issue of that paper for Jan. 7, 1801: "One of the first Acts of the Imperial Parliament, will be for the prevention of conspiracies among journeymen tradesmen to raise their wages. All benefit clubs and societies are to be immediately prohibited."

With reference to the paragraph in the "JOURNAL" last week (p. 44) as to the practical duplication of the productive capacity of the Bentham Gas-Works, it may be mentioned that the work was carried out by Messrs. J. Firth Blakeley and Co., of Thornhill Lees, Dewsbury; the plant furnished by them including a cast-iron tank, 41 ft. 6 in. in diameter and 14 feet deep, and a gasholder 40 feet in diameter. The same firm have recently supplied to the Formby Gas Company a Cripps patent automatic washer, with 10-inch valves and connections; also two 10 feet square purifiers, with roof and superstructure, to the Lasswade Gas Company. The purifiers were erected over the old ones; and the entire contract was completed in four weeks, without cessation of gas making, under the supervision of Mr. W. Young, of Edinburgh and Peebles, the Engineer for the work. Messrs. Blakeley and Co. have lately secured a contract for the supply of gas plant—including condenser, exhauster, gas-engine, washer-scrubber, and station meter—to the Meltham Urban District Council.

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Send full Particulars and Salary expected, to the RESIDENT ENGINEER, Water Company's Office, PORTSMOUTH.

WANTED, at once, a Gas-Fitter to fit up Houses on the Prepayment System (Iron or Compo.). Also to make himself generally useful on the District. Married Men only need apply. Wages 30s. per week of 68 hours, all overtime.
Apply, by letter, stating Age and Experience, to A. H. GODWIN, Manager, Gas-Works, WATFORD.

WANTED, for the North of England, two experienced CARBONIZING FOREMEN used to Inclined Retorts and Regenerative Furnaces. Standing Wages 41s. per week.
State, by letter, Age and References to No. 3622, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a thoroughly capable Works FOREMAN for a Gas-Works in the West Riding of Yorkshire, making 150 million cubic feet per annum. House, &c., all free on the Works.
State Wages required, Age, and References to No. 3623, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ALRESFORD GAS COMPANY.

WANTED, a Working Gas Manager who is competent to undertake the entire management of the Works and Manufacture the Gas himself. Coal Carbonized 500 Tons and upwards. A Night Man is found during part of the Year. Salary 28s. per week, House at the Works, Lighting, and Fuel free.
Intending applicants should write to me with three recent Testimonials.

J. RIDLEY SHIELD,
Secretary.
Alresford, Hants.

A SET of Four Second-Hand Purifiers wanted, with an area of not less than 190 feet each.
Offers, with full Particulars, to be sent in the first instance to No. 3603, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FIRMS having in Stock the No. 3 BURNER, with Bye-Pass, introduced by the NEW INCANDESCENT (Sunlight Patent) GAS LIGHTING COMPANY, LIMITED, in 1897, please communicate with A. CLARKE, 161, Albion Road, LONDON, N.

PURIFIERS.

WANTED, for the Waterford Gas- Works, by June next, a Set of New or Second-Hand PURIFIERS, with Connections. Square or oblong, about 250 feet super. Lutes at least 18 inches deep.
And FOR SALE later a Set of Five PURIFIERS, 10 feet square, with Four-Way Valve Connections, all in good order.
Apply to GEORGE ANDERSON, 35A, Great George Street, LONDON.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality.

SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

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JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

RETORTS.

THE Chester United Gas Company have FOR SALE 32 OVAL RETORTS, new, 21 in. by 15 in., 9 ft. long.
Apply to J. C. BELTON, Engineer and Manager, Gas-Works, CHESTER.

FOR SALE—£100 to £5000 of 3½ per CENT. PERPETUAL DEBENTURE STOCK. All Statutory Dividends have been paid during the last 48 Years.
Address H. R. BARNETT, Charlemont, Copthorne Road, WOLVERHAMPTON.

TO BE LET on Hire—

PULSOMETER, Size No. 5, with 4-in. suction and 3-in. delivery. Steam-Pipe 2½ in. diameter. Discharge 10,000 Gallons per hour.

TO BE SOLD—

GASHOLDER, 30 ft. diameter by 10 ft. deep, with Five Columns, equal to new, only having worked Four or Five Years.
EXHAUSTER for 63,000 feet per hour, with Steam-Engine, by Gwynne. In excellent condition. Replaced by 200,000 feet.
Write J. WRIGHT, Bridge House, BLACKFRIARS BRIDGE, E.C.

TENDERS FOR GAS COAL.

THE Magistracy of Copenhagen are pre- pared to receive TENDERS for the supply and delivery of 50,000 Tons of best GAS COAL from February, 1901, until the end of June, 1901.
The Magistracy reserve the right to divide the Contracts between two or more Contractors.
Further Information and Conditions for the delivery may be obtained on application to Kjobenhavns Belysnings, vœsen, Vestre Boulevard, Kjobenhavn B.
The Tenders, sealed and marked "Tilbud paa Kul," to be sent to Magistratens, 4de Afdeling, Lavendelstræde 1, Kjobenhavn K, before the 15th of January, 1901, Twelve o'clock, at which time the Tenders will be opened in the presence of the parties tendering who are in attendance.

THE MAGISTRACY OF COPENHAGEN.
Dec. 27, 1900.

NELSON CORPORATION.

THE Gas Committee are prepared to re- ceive TENDERS for the supply of FIRE-CLAY GOODS.
Specification and Form of Tender may be obtained on application to Mr. A. Allan, Engineer and Manager, Gas-Works, Nelson.
Tenders, endorsed "Fire-Clay Goods," and addressed to the undersigned, must be received not later than Jan. 24, 1901.
The Committee do not bind themselves to accept the lowest or any Tender.

R. M. PRESCOTT,
Town Clerk.
Town Hall, Nelson,
Jan. 2, 1901.

NELSON CORPORATION.

THE Gas Committee are prepared to re- ceive TENDERS for the supply of PURIFYING PLANT and HOUSE for same (Iron Structure), delivered and erected at their Brierfield Works.
Plans and Specification, with Form of Tender, and all Particulars, may be obtained on application to Mr. A. Allan, Engineer and Manager, Gas-Works, Nelson, on payment of Three Guineas, which sum will be returned on receipt of *bonâ-fide* Tender.
Tenders, endorsed "Purifying Plant," and addressed to the undersigned, must be received not later than Jan. 24, 1901.
The Committee do not bind themselves to accept the lowest or any Tender.

R. M. PRESCOTT,
Town Clerk.
Town Hall, Nelson,
Jan. 2, 1901.

HERNE BAY GAS AND COKE COMPANY, LIMITED.

TAR.

THE Directors of the above Company are prepared to receive TENDERS for the surplus TAR produced at their Works from Jan. 1 to Dec. 31, 1901.

It is estimated that the quantity will be about 30,000 Gallons.

Tenders, quoting Prices free on rail and in barge at Herne Bay, in Purchaser's own Casks, should be sent to the undersigned, at 6, Bream's Buildings, Chancery Lane, E.C., on or before Wednesday, Jan. 16, 1901.

By order,
H. E. NEWTON,
Secretary.

COUNTY BOROUGH OF BURNLEY.

TENDERS FOR PURIFIERS.

THE Gas Committee of the Burnley Corporation are prepared to receive TENDERS for the supply and erection of Two PURIFIERS, 30 feet square, with Iron Roof over same.

Specification with Bill of Quantities and Form of Tender may be obtained on application to the undersigned on payment of 10s. 6d., which will be returned on receipt of a *bonâ-fide* Tender.

Tenders, under seal, endorsed "Tender for Purifiers," and addressed to the Chairman of the Gas Committee, Town Clerk's Office, Town Hall, Burnley, to be delivered not later than Wednesday, the 16th of January, 1901.

JNO. P. LEATHER,
Gas Engineer.

Gas-Works, Burnley,
Dec. 26, 1900.

CORPORATION OF LEICESTER.

CAST-IRON PIPES.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of the necessary CAST-IRON PIPES and CONNECTIONS, from 2 inches to 12 inches in diameter, required during the Twelve Months ending the 31st of December, 1901.

Specification and Form of Tender may be obtained from the Engineer.

Tenders, addressed to Alderman Lennard, J.P., Mayor, Chairman, and endorsed "Tender for Cast-Iron Pipes, &c.," to be delivered at these Offices, not later than Eleven o'clock a.m., on Saturday, Jan. 12, 1901.

The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, Jan. 4, 1901.

WINDSOR ROYAL GASLIGHT COMPANY.

LIME.

THE Directors invite Tenders for Six Months' supply of the best flare burnt LIME for Gas Purification, in Truck Loads of 5 to 6 Tons each, delivered at Windsor Railway Stations, carriage free, and also price per Ton delivered on the Company's Premises.

Sealed Tenders to be sent in by Twelve o'clock at Noon on Tuesday, the 5th day of February, 1901.

By order,
JOHN HENRY STRANGE,
Secretary.

2, Victoria Street, Windsor.

TO TAR DISTILLERS AND MANUFACTURING CHEMISTS.

THE Windsor Royal Gaslight Company are prepared to receive TENDERS for the purchase of their surplus COAL TAR and AMMONIACAL LIQUOR (10-oz Liquor).

The Tar will have to be removed in Barrels; but the Liquor can be pumped into Railway Tanks on the Great Western Railway.

The Contractor must be prepared to keep the Company cleared of both Tar and Liquor, and to provide all the necessary Barrels for the purpose.

The Directors do not bind themselves to accept the highest or any Tender.

Sealed Tenders, stating price at the Company's Works free of all charges, must be sent in by Twelve o'clock at Noon on Tuesday, the 5th day of February, 1901.

By order,
JOHN HENRY STRANGE,
Secretary.

Gas Offices, 2, Victoria Street,
Windsor.

SOUTH METROPOLITAN GAS COMPANY.

SALE BY TENDER OF £80,000 THREE PER CENT. PERPETUAL DEBENTURE STOCK.

MINIMUM PRICE, £94 PER CENT.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £80,000 THREE PER CENT. PERPETUAL DEBENTURE STOCK, in accordance with the Provisions of the South Metropolitan Gas Acts, 1882 and 1896.

Particulars of same, with Form of Tender, can be obtained at this Office on application to the undersigned, and Tenders must be sent in on or before Tuesday, the 22nd day of January, 1901.

The Stock will be allotted to the highest bidders, but no Tender will be accepted at a lower price than at the rate of £94 money for each £100 Debenture Stock.

By order,
FRANK BUSH,
Secretary.

Offices: 709A, Old Kent Road,
London, S.E., Dec. 22, 1900.

COUNTY BOROUGH OF BURY.

TO RETORT AND FIRE-BRICK MANUFACTURERS.

THE Gas Committee are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, and FIRE-CLAY,

Forms of Tender may be obtained on application to Mr. H. Simmonds, Engineer and Manager, Gas-Works, Bury.

Tenders, sealed and endorsed "Tender for Retorts, &c.," to be sent to me not later than Monday, the 21st day of January, 1901.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bank Street,
Bury, Dec. 21, 1900.

COUNTY BOROUGH OF BOLTON.

THE Gas and Lighting Committee in- vite TENDERS for the supply of RETORTS and other FIRE-CLAY ARTICLES.

Particulars may be obtained on application to Mr. William Walch, Office Superintendent, Gas Offices, Bolton.

Sealed Tenders, endorsed "Tender for Fire-Clay Goods," and addressed to Alderman Miles, Chairman, should reach the Gas Offices, Hotel Street, Bolton, not later than Thursday, the 24th day of January, 1901.

R. G. HINNELL,
Town Clerk.

Town Hall, Bolton,
Jan. 4, 1901.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BRIGHTON AND HOVE GENERAL GAS COMPANY.

MR. ALFRED RICHARDS will Sell by AUCTION at the Mart, E.C., on Monday, Jan. 14, at Two o'clock, in Lots,

£20,000 "A" ORDINARY STOCK,

Ranking for a Standard Dividend of 7 per cent., subject to the Sliding-Scale; the last Dividend on the Company's "A" Stock having been at this rate.

Particulars of the SECRETARY of the Company, 5, GT. WINCHESTER STREET, E.C., and 77, West Street, BRIGHTON; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GASLIGHT AND COKE COMPANY.

ISSUE OF £163,190 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, Tokenhouse Yard, London, E.C., on Wednesday, Jan. 16, 1901, at Two o'clock precisely, in Lots.

£163,190 ORDINARY STOCK
OF THE
GASLIGHT AND COKE COMPANY.

This Stock, which is issued under the provisions of the Gaslight and Coke Company's Act of 1898, ranks for a Standard Dividend of 4 per cent. per annum, subject to the Sliding-Scale, under which, at the present price of Gas, the authorized rate of Dividend payable is £4 8s. per cent. per annum.

Particulars may be obtained at the OFFICES OF THE COMPANY, in Horseferry Road, Westminster, S.W.; and of the Auctioneer, 18, Finsbury Circus, LONDON, E.C.

By order of the Directors of the
NORTH MIDDLESEX GAS COMPANY.

NEW ISSUE OF 500 £10 ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Jan. 21, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
COLNEY HATCH GAS COMPANY.

NEW ISSUE OF £4500 ADDITIONAL STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Monday, Jan. 21, 1901, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
WEST HAM GAS COMPANY.

NEW ISSUE OF £11,916 FOUR PER CENT. PERPETUAL DEBENTURE STOCK,

Offering to Trustees and Others an Investment of the soundest character.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 22, at Two o'clock, in Lots.

Particulars of the SECRETARY of the Company, at the Offices, Union Street, STRATFORD; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

SOUTHAMPTON GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £13,750 FOUR PER CENT. DEBENTURE STOCK.

SALE BY TENDER.—MINIMUM PRICE 114 PER CENT.

INVESTMENT AT THIS PRICE YIELDS £3 10s. PER CENT.

REGISTERED FREE OF ALL EXPENSES.

THE Directors invite Tenders for £13,750 of DEBENTURE STOCK, authorized to be raised under the Southampton Gas Act, 1898, bearing a fixed and preferential Interest of 4 per cent. per annum, payable half-yearly (subject to Income-Tax).

Tenders must be delivered on or before Tuesday, the 15th of January next.

Forms of Tender may be obtained of the Secretary, at the Company's Offices, Ogle Road, Southampton, or from the Company's Bankers, Grant and Maddison's Union Banking Company, Limited, Southampton and Portsmouth, or from Lloyds' Bank, Limited, Lombard Street, London.

This Company's Stocks are now quoted in the Official Lists of the London Stock Exchange.

By order of the Directors,
C. CROWTHER SMITH,
Secretary.

Southampton, Dec. 28, 1900.

WATER AND GAS SHARES.

J. A. BYERLEY & SON, of 3, King's Terrace, Southsea, Portsmouth, have special facilities for DEALING in this CLASS OF SECURITIES, and invite CORRESPONDENCE from Buyers and Sellers. List of Stocks and Shares offering upon application. TELEGRAMS: "Stockbrokers, Portsmouth." NATIONAL TELEPHONE: 461. Established 1872.

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Describing the Manufacture of Gas and its Application to the purposes of Illumination.

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GUARANTEED absolutely free from Arsenic and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.

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PRICES REDUCED.
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Gas Companies are solicited to try Samples of the
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Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

JAMES OAKES & CO.
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

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GAS COALS.
Present Daily Produce over 5000 Tons.
Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation
Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power 16 7/10 Stand. Sperm Candl.
Coke (of good & pure quality) 13¾ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.
HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.
Present Daily Produce available 3000 Tons.
Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.
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OUT OF THEIR
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Messrs. J. & H. S. PATTINSON.
Yield of Gas per Ton . . 10,500 Cub. Ft.
Illuminating Power . . . 16·9 Candles.
Coke (of good quality) . . 67·5 per Cent.
Sulphur . . . . . 0·58 „
Ash . . . . . 2·73 „
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Yield of Gas per Ton. . 10,500 Cubic Feet.
Illuminating Power . . 16·9 Candles.
Coke . . . . . 66·7 Coke.
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Ash . . . . . 2·04 Ash.
As per Analysis by
Mr. JOHN PATTINSON, F.I.C., F.C.S.
For Prices, &c., apply to
W. H. PARKINSON,
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Yield of Gas per ton . . . . 13,155 cub. ft.
Illuminating Power . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

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Yield of Gas per ton . . . . 10,500 cub. ft.
Illuminating Power . . . . 17·8 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.
Yield of Gas per ton . . . . 10,500 cub. ft.
Illuminating Power . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.
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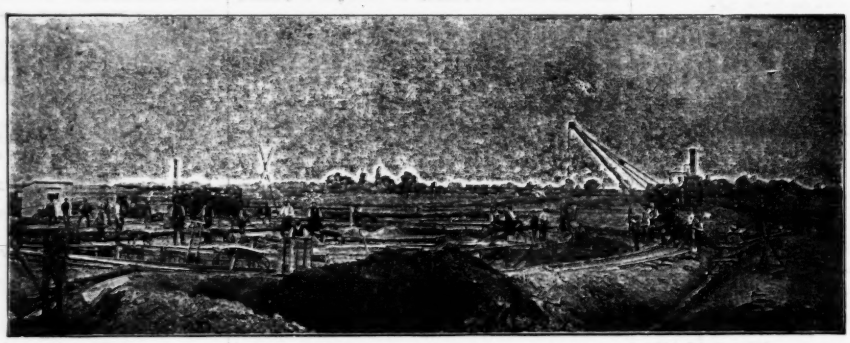

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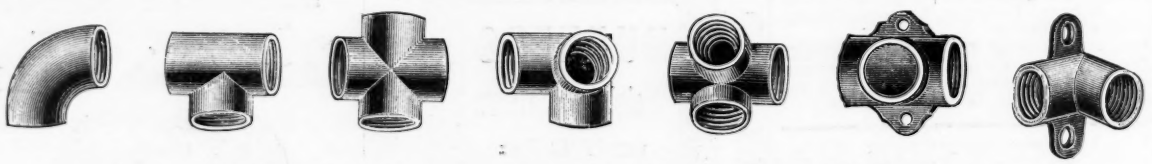

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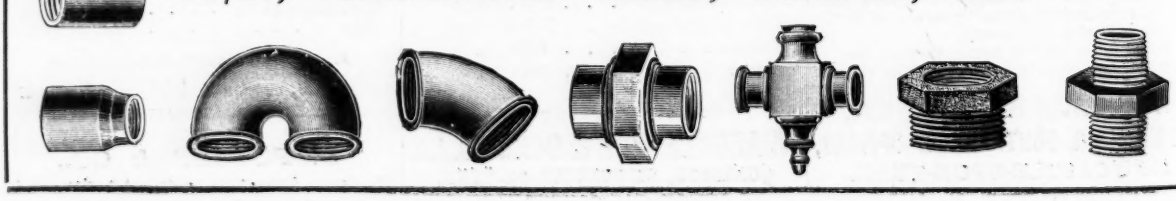

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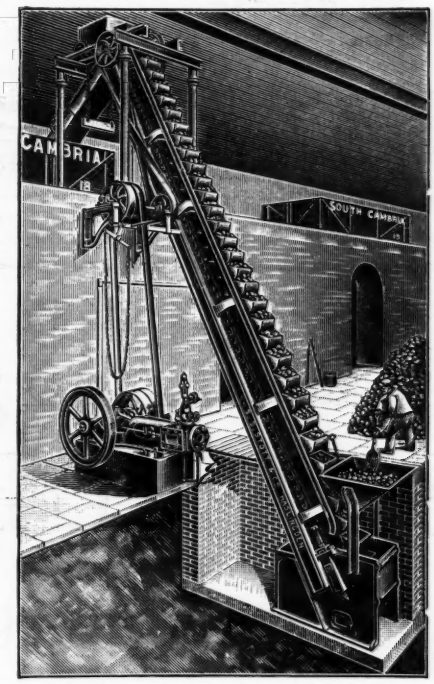

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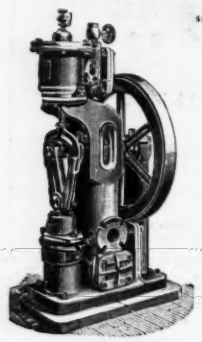

Fig. 705. "SINGLE RAM" STEAM-PUMP.

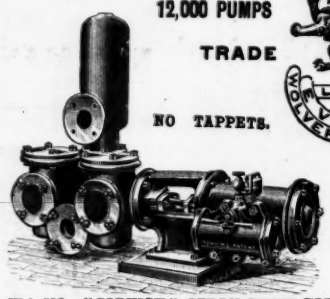

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

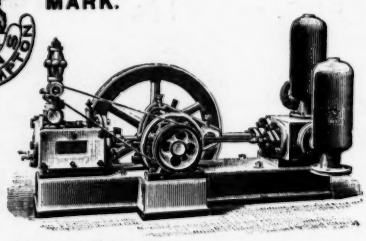

Fig. 688. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

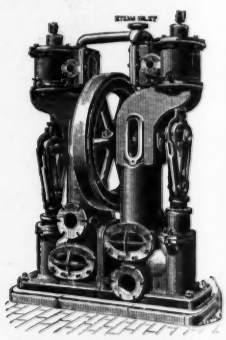

Fig. 713. "DOUBLE-RAM" STEAM-PUMP.

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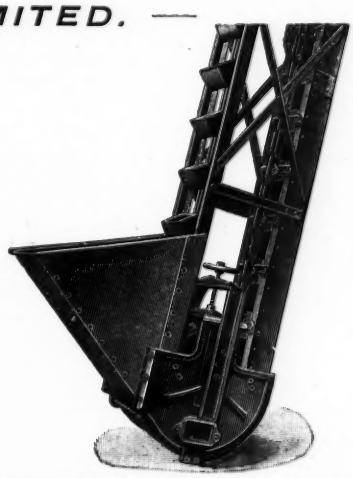

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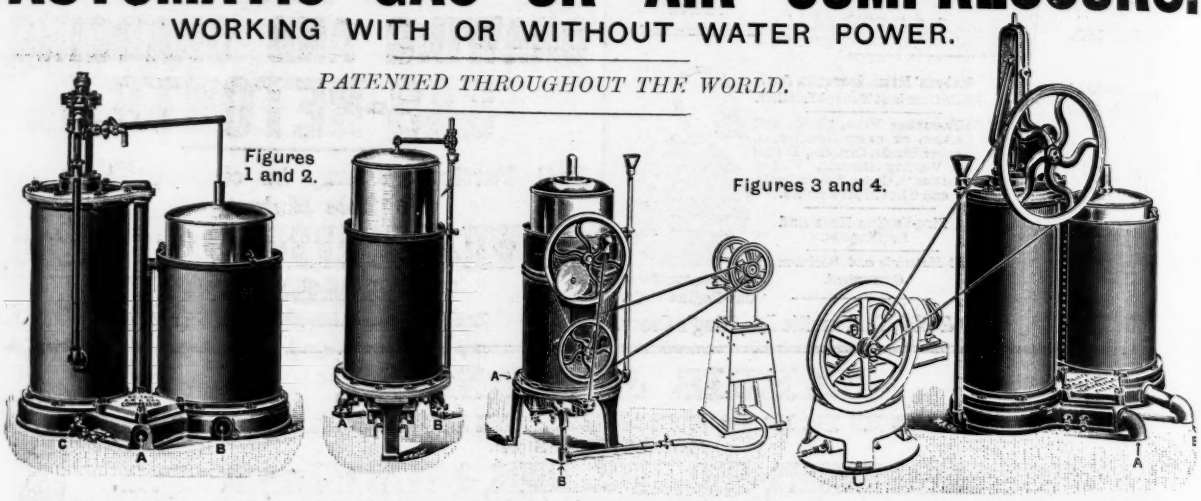

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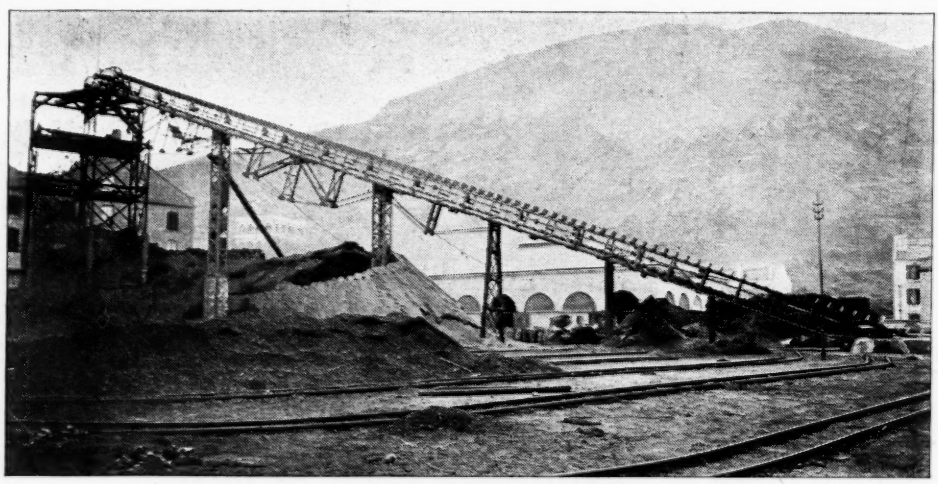

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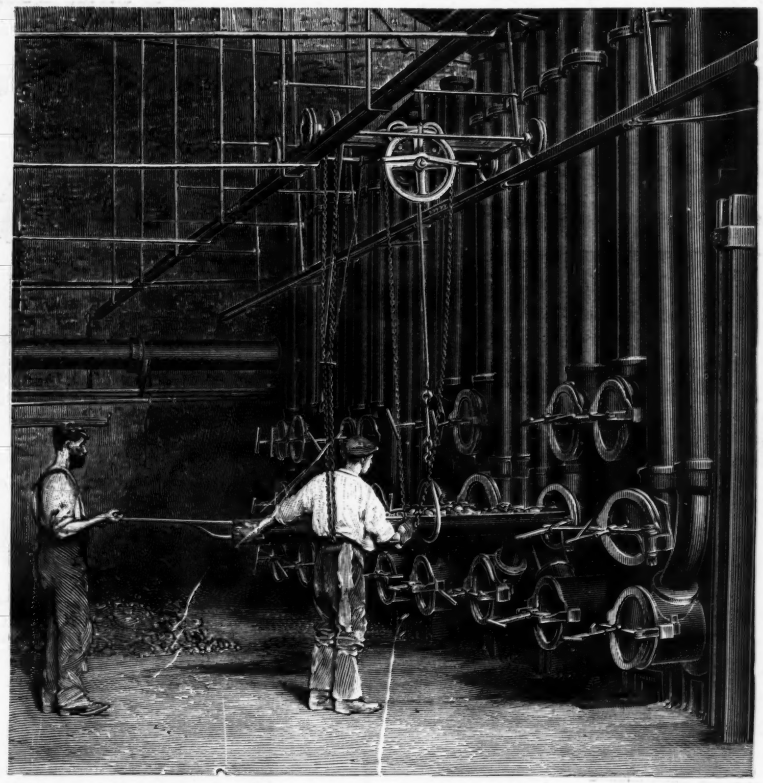

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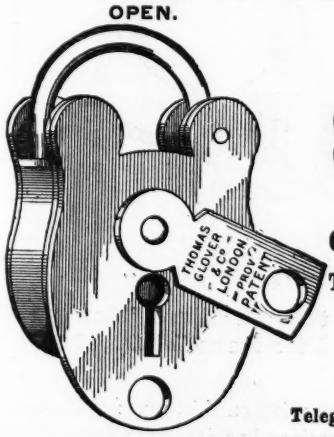

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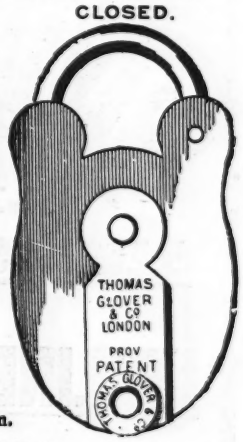

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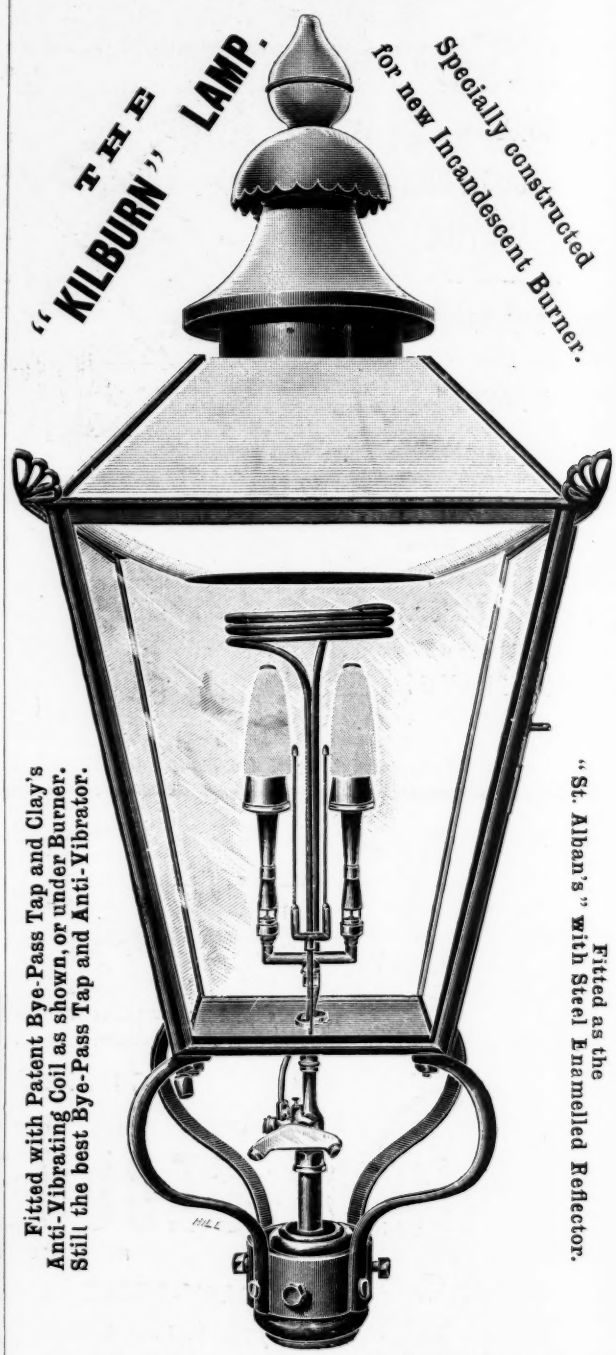

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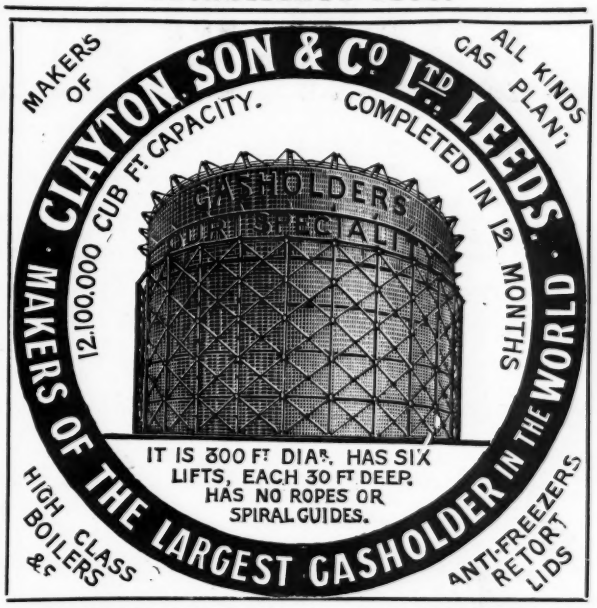
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